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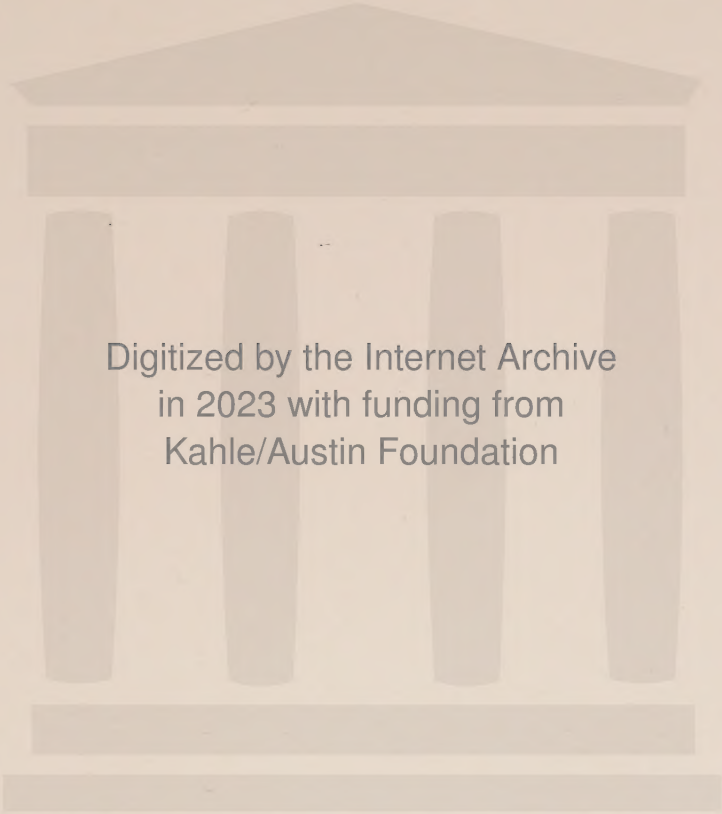

Photo. E. C. Ogden.

LITHOSPERMUM CROCEUM: FIG. 1, small flowering plant (TYPE), × ½; FIG. 2, fruiting stem, × ½; FIG. 3, back of bract, × 10; FIG. 4, fruiting calyx, × 4; FIG. 5, base of corolla-lobe and summit of tube, × 10.

L. CAROLINIENSE: FIG. 6, back of bract, × 10; FIG. 7, fruiting calyx, × 4; FIG. 8, base of corolla-lobe and summit of tube, × 10.

Photo. E. C. Ogden.

TANACETUM HURONENSE, var. TYPICUM: flowering stem and basal leaf, × 2/5, from Michigan; FIG. 2, achene, × 10, from Lake Superior.

T. HURONENSE, var. BIFARIUM: FIGS. 3 and 4, flowering plant and basal rosette, × 2/5, from Anticosti.

Photo. E. C. Ogden.

TANACETUM HURONENSE, var. TERRAE-NOVAE: FIGS. 1–3, flowering plants, × 2/5; FIG. 4, achene, × 10; all from Newfoundland.

T. HURONENSE, var. JOHANNENSE: FIG. 5, flowering branch, × 2/5; FIG. 6, achene, × 10, from New Brunswick.

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NOTES ON SOME PLANTS OF TENNESSEE

H. M. Jennison

This annotated list was begun with the idea of recording plant range extensions based mostly on collections made in recent years. A considerably larger number of entries have been made than was anticipated. In a few cases, part or all of the data presented here, has been published, but in widely scattered papers and books. A goodly part of the paper, however, is devoted to information that is brand new. In all but a very few cases the entries record an extension of range for the plants listed. The notes about *Belamcanda chinensis* (L.) DC., *Conradina verticillata* H.M.J., *Phyllitis Scolopendrium* (L.) Newm., and *Viola renifolia* Gray are notable exceptions.

To be able to tell of two new stations where the rare Sapsuckbush, *Buckleya distichophylla* (Nutt.) Torr., was found growing is something worth noting, as is also the discovery last summer (1933) of Red Spruce, *Picea rubra* (Du Roi) Dietr., in the Shady Valley Swamp, a boreal relic bog in Johnson County, Tennessee, at an elevation of 2800 feet. Several other remarkable finds were made in this Swamp and a detailed report may be expected soon from my colleagues, A. J. Sharp and J. K. Underwood.

Bailey's new (1934) *Rubus tennesseanus,* and two or three less recently described novelties appear in the list. The total number of plant species reported on is 94, of which 10 are Pteridophytes, and 84 are Spermatophytes.

No small number of the entries made are based on data and collections gathered in the summer of 1933 when much of the field work we did was encouraged and sponsored by the Tennessee Valley Authority. Some significant additions were made in 1934. Evidently

there is much left to be learned about the flora of Tennessee in particular, and the southern mountains and valleys in general. Yet it is believed that quite a complete and finished Flora of this region could be brought forth in a few years if adequate support for field surveys and taxonomic studies could be had.

Studied from the point of view of the whole, one is bound to notice additional evidence in support of the theory that the Southern Appalachian mountain region is the place where plant populations of the eastern part of this country were evolved, and the field from which, later, migrating groups took off. We find also supporting evidence of the theory that the southern mountains and valleys were the "reservoir" in which many northern emigrants found a safe harbor and a place to live while the ice sheets made the north country uninhabitable. As is well known, representatives of practically all of the "best families" have remained, and are well established in the mountains of the south.

Furthermore, one notes that an ever increasing number of plants, indigenous to the Coastal Plain and other provinces are being turned up in Tennessee. In all probability, Tennessee was once nearer to a sea coast. If what the geologists tell us in true, we should not be surprised to find Coastal Plain species in western Tennessee. But, may we not be quite thrilled when we find representatives of typical Coastal Plain genera like *Conradina*, *Orontium*, *Phyllanthus*, and even *Sarracenia* in remote sections of the Cumberland Plateau?

Also, one finds evidence of the further spread of aggressive immigrants from Europe, such as *Geranium columbinum* L., *Malva moschata* L., *Potentilla recta* L., *Sanguisorba minor* Scop.; and of two oriental Lespedezas.

Lastly one may remark, particularly in the case of the indigens whose range extensions are recorded, that known calcicoles and oxylophytes were found restricted to the soil types of which they are well known inhabitants.

The present work would not have been possible without the valued help of cetain colleagues and friends. In particular I wish to acknowledge my indebtedness to the following: Messrs. A. J. Sharp and J. K. Underwood, field aids and plant hunters par excellence, whose spirited collaboration at all times was a great inspiration and help. To Mr. C. A. Weatherby I owe much for encouragement and kindly advice, generously given. Dr. H. K. Svenson and Dr. E. T. Wherry contributed many items of interest and importance in a most un-

selfish fashion. The valued assistance of several specialists was had in checking the specific identity of certain plants.

TRICHOMANES PETERSII Gray.[1] On rocks of siliceous nature. Bluff along middle prong of Little River, about five miles beyond Townsend, Great Smoky Mountains National Park, Blount Co. Collected April 11, 1931, *A. J. Sharp, H. M. Jennison and H. Bishop.*[2] A new station was discovered near the original one in April, 1934, by *A. J. Sharp and H. M. Jennison.*

WOODWARDIA VIRGINICA (L.) Sm. In spongy muck soil over limestone, near Whitwell, Marion Co., associated with *W. areolata.* Coll. May, 1931, *Hobart Massey.*

Specimens of this fern from this station have been filed in The Herbarium of the University of Tennessee.

ASPLENIUM EBENOIDES R. R. Scott.

Anderson[3] predicted the possible discovery of this rare fern in Tennessee. Recently Shaver[4] reported having found it growing at two stations near Nashville in Davidson County and at Beersheba Springs, Grundy County.

THELYPTERIS CRISTATA (L.) Nieuwl. With Sphagnum, in humus over mixture of calcareous and siliceous rocks, Shady Valley Swamp, 2800 ft. elev., Johnson Co., July, 1933, *A. J. Sharp and J. K. Underwood.*

THELYPTERIS PALUSTRIS (Salisb.) Schott var. PUBESCENS (Lawson) Fernald. Associated with *Thelypteris cristata* (L.) Nieuwl. and sphagnum in humus over a mixture of calcium-bearing and siliceous rocks. Shady Valley Swamp, 2800 ft. elev., Johnson Co., June 15, 1933, *A. J. Sharp and J. K. Underwood.*

Gattinger[5] lists this fern and many have seen it in Middle Tennessee, but no specimen of it was kept by him. Svenson[6] has collected and presented specimens of the fern in question, from Kingston Springs, Cheatham Co., Aug. 20, 1922. *Svenson* No. 269.

THELYPTERIS PHEGOPTERIS (L.) Slosson (Syn. *Phegopteris polypodiodes,* Fée). In shallow cold soil, near top of Mt. LeConte, Great Smoky Mountains National Park, Sevier Co. Collected June 25, 1933, by *A. J. Sharp and J. K. Underwood.*[7]

Gattinger reports this species from "Mountains of East Tennessee." Dr. Gattinger may have been mistaken in identifying this fern, as have been many others. There were no Gattinger specimens in

[1] Anderson, W. A. Am. Fern Journ. **21** (1931).
[2] Sharp, A. J. Am. Fern Journ. **21** (1931).
[3] Anderson, W. A. Univ. of Tenn. Record. **6** (1929).
[4] Shaver, Jesse M. Am. Fern Journ. **24** (1934).
[5] Gattinger, A. Flora of Tenn. (1901).
[6] Svenson, H. K. Am. Fern Journ. **20**: 145–146. (1930).
[7] Sharp, A. J. & Underwood, J. K. Am. Fern Journ. **23**: (1933).

the destroyed (Jan., 1934) U. T. Herbarium. Collected subsequently (Sept., 1934) by A. J. Sharp.

WOODSIA SCOPULINA D. C. Eaton. Bluff of Nolichucky River, 4 miles south of Erwin, Unicoi Co. *Edgar T. Wherry*, June, 1933.

"This place was discovered by William A. Knight of Biltmore, N. C., but I was the first to identify the Woodsia. (Probably the *W. ilvensis* (L.) R. Br., Gattinger reports is the same thing.) At that locality the fern is unusually luxuriant, which is all the more remarkable in that unlike the other eastern states colonies, it faces east, and is at rather low altitude," E. T. Wherry in letter, Nov. 29, 1933. Gattinger[1] does report *Woodsia ilvensis* (L.) R. Br. as having been collected in Knox. Co., by the late Albert Ruth; but there were no specimens in the U. of T. Herbarium (which included Gattinger's Collection) to substantiate the report.

Specimens of this fern species were collected for the Univ. of Tenn. Herbarium in July, 1934.

PHYLLITIS SCOLOPENDRIUM (L.) Newman (Syn. *Scolopendrium vulgare* Sm.)

Apparently it is only a question of time until the famous isolated colony of this fern, in Marion Co., Tennessee shall have been exterminated. We have known of the situation and have watched it for several years. The station is wholly unprotected and unguarded. Botanical pilgrims from far and near have visited the shrine in the past and some have probably taken away "fragments" of the holy grail. Then too, the natural environment is not conducive to the colony even holding its own. In 1932 we were reliably advised that only about a half dozen plants remained. "In the summer of 1933," reports Dr. E. T. Wherry (letter as of Nov. 29, 1933), "only five (5) plants remain of the former vast colony . . . ." I doubt if ever the colony was a vast one, but it certainly is a fast disappearing one. Unless a Fern Society, or an Ecology Society, or Uncle Sam, or someone establishes a monument at the site of this Hart's Tongue fern colony, and protects it, it will be just a question of time until somebody will propose erecting a memorial to mark the spot.

LYCOPODIUM LUCIDULUM Michx. var. POROPHILUM (Lloyd and Underwood) Clute. In cold wet soil near top of Mt. LeConte, at 6000 ft. elev., Great Smoky Mountain National Park, Sevier Co. Collected May 8, 1933 by *A. J. Sharp.*

ISOETES ENGELMANNI R. Br. var. VALIDA Engelm. In wet humus in creek, Shady Valley Swamp, Johnson Co., 2800 ft. elev. Collected June 14, 1933, by *A. J. Sharp and J. K. Underwood.*

PINUS STROBUS L.

Svenson[1] reported an outpost colony of several trees, which he discovered (Aug., 1922) growing in the summit of the high bluffs south of Craggie Hope, Cheatham Co. This station is well beyond the usual range of this species in Tennessee.

Thuja occidentalis L. In shallow soils over dolomite along Clinch River tributaries. Southern outpost, relic colonies in Roan, Anderson, Campbell and Union Counties; Emory Heights station near Harriman, farthest south.

Picea rubra (Du Roi) Dietr. In deep humus over calcareous rocks, Shady Valley Swamp, 2800 ft. elev. June 14, 1933, *A. J. Sharp and J. K. Underwood.* Next nearest (?) station twenty to twenty-five miles (Roan Mt. and White Top Mt.).

It is well known that the Red Spruce occurs abundantly at many places in Tennessee, always, however, at much higher elevations and in or over soils of siliceous origin.

Potamogeton Purshii Tuckerman. In lagoon of Clear Fork River, Morgan Co., about one mile north of Rugby. Coll. June 28, 1933, *H. M. Jennison.*

The specimens collected were immature, and could not therefore be positively identified. However, Prof. M. L. Fernald tentatively refers the material collected to the above named species.

Juncus gymnocarpus Coville. Found and collected along Laurel Creek near Bote Mt., Blount Co., Great Smoky Mountains National Park. *A. J. Sharp,* August 21, 1934.

The known occurrence of this species appears to be very limited. Small[2] says: "Acid swamps; known only on coastal Plain in W. Florida and on Appalachian Plateau in Eastern Pennsylvania."

Panicum longifolium Torr. Discovered and collected in Tennessee, at Tullahoma, Coffee Co., by H. K. Svenson, at "edge of dried swamp" Aug. 24, 1930. *Svenson* No. 4234. Det. A. Chase.

Panicum consanguineum Kunth. Discovered and collected in Tenn., by H. K. Svenson at "edge of dried out swamp," Aug. 24, 1930, Tullahoma, Coffee Co., *Svenson* No. 4235. Det. A. Chase.

Panicum trifolium, Nash. Discovered and collected in Tennessee, Aug. 24, 1930, Tullahoma, Coffee Co., "dried out edge of swamp." *Svenson* No. 4236. Det. A. Chase.

Cyperus dipsaciformis Fernald. Discovered and collected by *A. J. Sharp,* Aug. 28, 1934. Wet, sandy soil along Abrams Creek, near boundary of Great Smoky Mountains Park, Blount Co.

Specimens of this rather odd and striking sedge were found growing in sandy alluvium on the flood plain of a creek in the southern Ap-

[1] Svenson, H. K. Rhodora 27: 27, 28 (1925).
[2] Small, J. K. Manual of the Southeastern Flora (1933).

palachians at an altitude of about 1500 feet above sea level and many miles inland from its best known habitations in the coastal plain province. This is the first report, as far we know, of the occurrence of this species in Tennessee.

Rynchospora capillacea Torr. Wet soil near Cedar Creek, Campbell Co., July 4, 1933, *J. K. Underwood.*

Carex Ruthii Mackenzie. This rare mountain sedge we find in rich wet soil at "Grassy Patch," Great Smoky Mountains National Park, Sevier Co., at 4000 ft. elev. Coll. Aug. 12, 1930 by *J. K. Underwood.*[1] Also, in wet rich soil, Roan Mt., 6000 ft. elev., Carter Co., July 11, 1931, *J. K. Underwood.*

Carex eburnea Boott. This sedge has been collected several times in East Tennessee within the past forty years, but was first turned up in Middle Tennessee by H. K. Svenson as noted. Limestone soils on dry slope of bluffs, Trumble Creek. Craggie Hope, Cheatham Co., Aug. 22, 1930, *Svenson,* No. 4210. Vide J. K. Underwood, l. c.

Carex platyphylla Carey. Limestone soils, Clinch River watershed, Roan, Union, Grainger and Campbell counties, 1933, *J. K. Underwood.*

A specimen of what proves to be this species was collected at Emory Heights, Roan Co., in 1898 by T. H. Kearney. Vide J. K. Underwood, l. c.

Carex laxiculmis Schwein. Paradise Ridge, Oak Barrens, Middle Tennessee. Legit *Dr. A. Gattinger* (no date). Low ground in woods along a stream near Lea Lakes, Blaine, Grainger Co., June 17, 1931, *J. K. Underwood.* Moist alluvial soils, Union Co. and Johnson Co., summer 1933, *J. K. Underwood.*

What appears to be the above named species was reported by Gattinger as *C. digitalis,* occurring in "low ground over the state." A single sheet in the Gattinger Collection originally at the University of Tennessee is all we had to support Gattinger's record. Later day collections in East Tennessee by J. K. Underwood more or less substantiate Gattinger's statement.

Carex cherokeensis Schwein. This rare species was found growing in the cedar glades at Lavergne, Rutherford Co., by *H. K. Svenson,* June, 1930.

Carex folliculata L. In the wet humus, Shady Valley Swamp, 2800 ft. elev. Johnson Co., June 14, 1933, *J. K. Underwood.* Not before reported from Tennessee.

Carex rostrata Stokes. A sedge of the north country heretofore not known to occur farther south than Delaware. Discovered last summer (1933) in upper East Tennessee. In shaded wet, boggy

[1] Underwood, J. K. Journ. Tenn. Acad. Sci. 7: 104 (1932).

places, Shady Valley Swamp, 2800 ft. elev., Johnson Co., June 14, 1933. *J. K. Underwood and A. J. Sharp.* Vide J. K. Underwood, l. c.

Carex projecta Mack. In wet humus. Shady Valley Swamp, Johnson Co., first collected in Tennessee, June 14, 1933, by *J. K. Underwood.*

Carex Crawfordii Fernald. With grasses in moist rich soil in open "park" at 4200 ft. elev., on Roan Mt., Carter Co., July 11, 1931, *J. K. Underwood.*

Arisaema nepenthoides Mart. Persisting on places where planted and later abandoned in region around Knoxville. An occasional plant offered for sale at the Market House in Knoxville. Specimen formerly in U. of T. Herbarium, (destroyed in Morrill Hall fire, Jan. 18, 1934). Coll. spring 1932, *H. M. Jennison.*

Xyris torta Smith. Specimens collected by Gattinger (1881), the writer (1930) and possibly others were identified as *X. flexuosa,* a name now to be replaced by *X. torta* Sm. Damp sandy soil in "oak barrens" near Mayland, Cumberland Co., July 12, 1930, *H. M. Jennison.* Moist places, gravelly oak woods six miles east of Crossville, Cumberland Co., *H. K. Svenson* No. 4155.

Belamcanda chinensis (L.) DC. "Introduced (?)".[1] Collected in isolated place, Brown's Mt., Knox Co., June 1925, *H. M. Jennison.* Abundant in isolated places, Clinch River watershed, *A. J. Sharp,* 1933.

Gattinger wrote in 1901: "Very abundant, I collected it already fifty years ago in the remotest mountain glens, and think it is really indigenous, not naturalized from Asia."

Habenaria lacera (Michx.) R. Br. Found growing in deep moist humus in woods. Coll. in Shady Valley Swamp, Johnson Co., at 2800 ft., elev., June 14, 1933, *J. K. Underwood and A. J. Sharp.*

Gray's Manual (1908) gives distribution as "wet or moist open ground, Nfd. to Minn., southward to Mo. and Ala."

Epipactis pubescens (Willd.) A. A. Eaton. As predicted by Gattinger this orchid was collected in the high mountains of East Tennessee, but a remarkable discovery by H. K. Svenson in 1930 extends its range to Middle Tennessee. "In leaf mould, summit of bluff along Turnbull Creek, Cheatham Co., Aug. 22, 1930," *Svenson* No. 4215.

Listera Smallii Wiegand. In rich wet humus, Shady Valley Swamp, Johnson Co., 2800 ft. elev., coll. June 18, 1933, *H. M. Jennison and A. J. Sharp.*

Buckleya distichophylla (Nutt.) Torrey. "One of our rarest plants," said Sargent, but Paint Rock, Cocke Co., was *not* "only place in America" (ibid.) where it grew wild. The Paint Rock colony has been destroyed. Coll. at Wolf Creek, 1500 ft., elev. 1928, 1930, 1932. *H. M. Jennison.*

The late W. W. Ashe recalled having collected it on the south fork

[1] Robinson, B. L. & Fernald, M. L. Gray's New Manual of Botany (1908).

of Holston River and certain of its tributaries in southwest Virginia and Tennessee, and he also recalled having seen it along waters of Pigeon River and in Haywood Co., North Carolina. Sept., 1933, A. J. Sharp and J. K. Underwood discovered a colony of this rare shrub along the banks of a stream tributary to the Holston River in Johnson Co., Tennessee. "On Bluff of Nolichucky River four miles south of Erwin" reports E. T. Wherry in a letter of Nov. 29, 1933. "Another rarity," he continues, "but the natives are cutting the hemlocks, so it is likely to be exterminated there."

Summary: Occasional in sandy soils under hemlocks, banks of streams tributary to Holston and French Broad Rivers.

Polygonum opelousanum Riddell. A plant of the coastal plain and adjacent provinces. Discovered and collected in Coffee Co., Tenn., Aug. 24, 1930 by H. K. Svenson. Found growing at "margin of swamp." *Svenson* No. 4233.

Ranunculus laxicaulis (T. & G.) Darby. Gattinger catalogues *R. obtusiusculus*, as occurring in "ponds along the Cumberland River," but we did not have a single specimen of this species in the old U. T. Herbarium until collections of it were made in the Shady Valley Swamp, 2800 ft. elev., Johnson Co., August 1933, *A. J. Sharp and J. K. Underwood.* "Chiefly at low altitudes."[1] All our specimens of this species were destroyed by fire on Jan. 18, 1934.

Ranunculus allegheniensis Britton. Known to occur in the Blue Ridge and more northernly provinces, but not heretofore reported from Tennessee. Collected at middle elevations, Rip-shin ridge, base of Roan Mt., Carter Co. *A. J. Sharp*, May, 1934.

Caltha palustris L. Found in muck soil in Shady Valley Swamp, Johnson Co., by *A. J. Sharp and J. K. Underwood*, May 1934. Gattinger reported having found it in "boggy mountain meadow, Ducktown," but there was no specimen in the Gattinger herbarium (destroyed in the Morrill Hall fire Jan. 18, 1934).

Drosera rotundifolia L. Discovered growing in sand and humus in "pockets" on sandstone cliff along a creek, in a forested area. Coll. near Allardt, Fentress Co., *A. J. Sharp*, Nov. 1933, June, 1934. Collected in a boggy place near Clark Range, Fentress Co., Oct. 1934, *H. M. Jennison.*

Sarracenia sp.

Gattinger reported *Sarracenia purpurea*, L. occurring in "low grounds along Mississippi, Tennessee and Buck Rivers, April." We have never relocated and to the best of my information Gattinger's report has never been substantiated. There were no Tennessee exsiccatae of this species in the Gattinger Collection at the University of Tennessee.

Believing that one or more species of *Sarracenia* should be found growing wild in the Cumberland Plateau region, we have been con-

[1] Robinson, B. L. & Fernald, M. L. Gray's New Manual of Botany (1908)

stantly on the watch for specimens. Recently (13th Oct., 1934) we succeeded in finding a single plant in a bog near Clark Range, Fentress Co. No flowers or fruits were found so it was quite impossible for us to determine the specific identity of the specimen. An overly enthusiastic member of the party dug the only plant found, but we transplanted it promptly in sphagnum and soil from its native habitat, hoping that it would survive and subsequently flower.

Sedum roseum (L.) Scop. Occurring on some of the high tops of Southern Appalachian mountains.

Wherry "found it practically exterminated by the natives, who grow it in buckets around their cabins." E. T. Wherry, letter of Nov. 29, 1933.

Parnassia grandifolia DC. Heretofore unknown from Tennessee. In cold wet humus over dolomite rocks, border of woods along Cedar Creek, Anderson Co., July 4, 1933, *A. J. Sharp and J. K. Underwood.*

This station will have been inundated a year or two hence when the Norris Lake basin fills.

Ribes curvatum Small. Not heretofore reported to be growing wild north of Stone Mt. Georgia (It appears to have "escaped" in the vicinity of Highlands, North Carolina, where it was planted several years ago). Discovered growing in abundance in well-drained rocky soil along creek near Pikeville, Bledsoe Co., by "A White Pine Blister-rust Scout," May, 1934. Later (July 14, 1934) collected near Whitwell, Hamilton Co., by *J. K. Underwood and A. J. Sharp.* Specimens in U. of T. Herbarium.

Ribes lacustre (Pers.) Poir. The above-named species was discovered growing in a colony of considerable size near the top of Mt. LeConte, 6300 ft. elev., Great Smoky Mountains National Park. Coll. *A. J. Sharp,* Aug. 1934.

Waldsteinia fragarioides (Michx.) Trattinick. Reported by Svenson[1] from collections made along the Turnbull River near Craggie Hope, Cheatham Co., Aug. 1922.

This species is quite common in the river-valleys in East Tennessee.

Potentilla recta L. Poor soil, creek bottoms, upper East Fork of Little River, Great Smoky Mountain National Park, Sevier Co., June 30, 1928, *H. M. Jennison.* In alluvial soil along a stream, near road over Holston Mt., Sullivan Co., June 14, 1933, *A. J. Sharp and J. K. Underwood.*

Well known in waste places, Maine to Ontario, New York, Virginia and Michigan. Not reported by Gattinger. Evidently be-

[1] Svenson, H. K. Rhodora 27: 27, (1925).

coming more wide spread through being introduced locally, in one way or another.

Rubus tennesseanus L. H. Bailey.[1] Found in soils of siliceous origin on Rich Mountain, Great Smoky Mountain National Park, Sevier Co. Coll. Aug. 1933, *L. H. Bailey.*

Sanguisorba minor Scop. In clay soil, open field near a garden, Knoxville, Knox Co., 1925, *H. M. Jennison.*

Lespedeza sericea Miq. Introduced from the Orient; for some years known to be naturalized and wide-spread in Eagle Creek Valley, Overton Co.

Lespedeza stipulacea Maximowicz. Naturalized from Korea. Now widely established in Middle Tenn., and known to be quite widely naturalized throughout the Mississippi River basin.

Geranium columbinum L. With grasses and *Potentilla recta* L., in alluvium near a stream along highway; probably the site of a road camp. Holston Mt., Sullivan Co., June 14, 1933, *A. J. Sharp and J. K. Underwood.*

A European introduction of more or less frequent occurrence in waste places in northern parts of the coastal plain province. Its discovery in 1933 in upper East Tennessee was a surprise.

Phyllanthus carolinensis Walt. In moist sandy soil, base of eastern front of the Cumberland Mountains, near Speedwell, Claiborne Co., Oct. 15, 1933. *H. M. Jennison and A. J. Sharp.*

This species appears to be the only one representing this tropical genus, which has migrated very far into the United States. We discovered its occurrence in Tennessee last fall (1933).

Pachysandra procumbens Michx. Specimens sent to U. T. by *Mrs. M. M. Betts,* who collected the plants in the vicinity of Memphis, April 1932.

This species is quite frequently collected in the woods in the hilly eastern part of Tennessee. Mrs. Betts' collection from a station near Memphis is from a point over 200 miles west of the well established range of the species.

Berchemia scandens (Hill) Trel. In alluvial soil near creek near Jasper, Marion Co., May 2, 1931, *H. M. Jennison and A. J. Sharp;* also collected by *E. J. Alexander* near White Creek south of Rockwood, Roan Co., Oct., 1933.

The latter station is considerably north of previously reported localities in Tennessee.

Vitis Baileyana Munson. In calcareous soil at roadside near Fountain City, Knox Co., coll. Aug. 1933, by *L. H. Bailey.* "Common

[1] Bailey, L. H. Gentes Herbarum, 3: 270 (1934).

along French Broad River," according to W. W. Ashe who collected it in Cocke Co. (L. H. Bailey letters Dec. 5–18, 1933).

Hypericum graveolens Buckley. In wet sandy alluvium, edge of Roaring Fork Creek, 4500 ft., elev., Mt. LeConte, Great Smoky Mountain National Park, Sevier Co., June 25, 1933, *A. J. Sharp.* Roan Mountain, Carter Co., July 27, 1889, *F. Lamson-Scribner.* In wet soil with sedges, swamp rose and other plants, Shady Valley Swamp, Johnson Co., 2800 ft. elev., June 14, *A. J. Sharp and J. K. Underwood.*

Gattinger reported this species from "Summit of Thunderhead" (mountain), but from this one cannot tell whether the station is in Tennessee or North Carolina. We now have records to prove that this plant occurs on the Tennessee side of the high mountains.

Hypericum Mitchellianum Rydb. Specimens of this species were found and collected in Tennessee on Mt. Collins, at about 5000 ft. elev., in the Great Smoky Mountains National Park. *A. J. Sharp,* Aug. 6, 1934.

Hypericum ellipticum Hook. In wet soil, open field. Coll. near Elizabethton, Carter Co., June 14, 1933, *A. J. Sharp and J. K. Underwood.*

Hypericum virginicum L. With sedges in wet humus, Shady Valley Swamp, Johnson Co., 2800 ft. elev., coll. Aug. 22, 1933, *A. J. Sharp and J. K. Underwood.*

Viola renifolia A. Gray. A distinctly northern species, found in "Arbor Vitae swamps and cold woods, Nfd. to the Mackenzie R., south to N. E., Pa., Mich., and Minn." Plants (probably not seen by Brainerd) collected on summit of Thunderhead Mountain, 5530 ft. elev., July 1888, *Gattinger* were named *V. renifolia* Gray. See also Gattinger.

I am of the opinion that Gattinger was in error in the case referred to above, because (1) the station which is in Blount Co. at an elevation of 5530 ft. is far to the south of the known range of the species; (2) the habitat is extremely dissimilar, not only in the absence of arbor vitae, but also in having soils of siliceous origin; (3) the specimens named by Gattinger (originally in the U. of T. Herbarium) had glabrous leaves of cordate, not reniform shape, and at least one of the plants had a distinct runner.

Malva moschata L. In fine textured soil at roadside near Cole Place, Shady Valley, 2800 ft. elev., June 18, 1933, *H. M. Jennison and A. J. Sharp.*

Gattinger predicted the occurrence of this species in Tennessee on his knowledge of its occurrence in south west Virginia. It was discovered growing in upper East Tennessee last summer (1933).

Angelica atropurpurea L. Border of woods, Shady Valley

Swamp, 2800 ft. elev., Johnson Co., June 14, 1933, *J. K. Underwood and A. J. Sharp*, 33–167.

An extension of range southward from the latitude of Delaware.

Cornus obliqua Raf. A recent find, occurring in moist soils of limestone origin. Collected on bluffs along Cedar Creek near La Follette, Campbell Co., June and July 1933; *J. K. Underwood.*

A well known inhabitant of low places, near swamps, ponds and lakes in Indiana, especially at the north.

Kalmia carolina Small. In deep humus over limestone bed rock in Shady Valley Swamp, Johnson Co., June 1933, *A. J. Sharp and J. K. Underwood.*

Epigaea repens L. "Sparingly in deciduous and *Pinus virginiana* woods. Not otherwise seen in Middle Tenn." *H. K. Svenson*, in sched. No. 4212, coll. Aug. 22, 1930. Craggie Hope, Cheatham Co., Tenn.

Gray's Manual gives the distribution of this as follows: "Nfd. to Sask., Wisc., Mich., Ky., and Fla." Gattinger catalogues it and gives its distribution as: "Cumberland and Alleghany Mts."

The fruits of this species are not commonly developed it seems, but during the spring of 1933 we found and collected plants with fruit, several times. Again in 1934 plants with fruit were collected.

Gaylussacia brachycera (Michx.) Gray. Found growing in sandy soils, Fentress Co., along Clear Fork River, near Rugby, July 13, 1930, *H. M. Jennison.* Morgan Co., also near Rugby, Aug. 19, 1930, *H. K. Svenson.* Three miles south of Allardt, Fentress County, May 15, 1931, *Essary, Jennison, Sharp and Underwood.*

Gattinger reported this species from "Slopes of Alleghanies," Parksville, Ocoee River, Polk Co. This station is far to the south of the known stations for this species, and as far as I am aware, it has never since been relocated at Gattinger's station. There were no specimens of the species in question from Parksville in the Gattinger collection in the U. T. Herbarium.

Vaccinum macrocarpon Ait. This cranberry, well known in the northeastern United States, was recently discovered growing in a boreal relic bog in upper East Tennessee. With sphagnum in cold peat. Shady Valley Swamp, 2800 ft. elev., Johnson Co., June 14, 1933, *A. J. Sharp and J. K. Underwood.*

Bartonia lanceolata Small. Plants identified as being this species were found growing in a wet acid bog having a sandstone subsoil, near Clark Range, Fentress Co. Collected Oct. 13, 1934, *H. M. Jennison.*

Bartonia paniculata (Michx.) Robinson. Found and collected in Tennessee by H. K. Svenson. Its occurrence in this state is known

to us only through his record: "A few plants in a dense swamp," Hollow Rock Junction (Bruceton), Carroll Co., August 31, 1930. *H. K. Svenson* No. 4382.

Asclepias perennis Walt. Our herbarium records indicate that this milkweed is a coastal plain endemic. At any rate its occurrence and distribution in Tennessee is indicated by the following: Forked Deer River bottoms near Henderson, Chester Co., *S. M. Bain* 161; "River Bottoms through West Tennessee," along Forked Deer River, Haywood Co., *S. M. Bain*, June 1893; swamp. Shiloh, Hardin Co., *H. K. Svenson* No. 4325; low wet sandy places near Reelfoot Lake, Obion Co., *Jason R. Swallen*, No. 2143.

Phlox ovata L. Occurs scattered through five counties in East Tennessee, *viz.*, Cocke, Hamilton, Hawkins, Knox and Roan, according to Wherry.[1]

"A northern Blue Ridge species enters the state. Gattinger had it listed, but he misapplied the name to *P. carolina*, so its authentic report in the state is new." E. T. Wherry, letter of Nov. 29, 1933.

Phlox stolonifera Sims.

"A northern Appalachian species, reaches a southeastern limit in the state, being known in three eastern marginal counties; Cocke, Polk and Sevier. Gattinger knew it (as *P. reptans*) only in Polk Co." E. T. Wherry, letter of Nov. 29, 1933.

Phlox bifida Beck.

Recorded and distributed by Gattinger as *P. stellaria*, from the Cedar glades near Lavergne, Rutherford Co. Wherry has shown this to be the only place in Tennessee where it occurs.

"The rare variety *stellaria* (only 6 stations known) reaches its southeastern limit here (Lavergne). I rediscovered Gattinger's locality, just north of Lavergne, in cedar glades." E. T. Wherry, letter of Nov. 29, 1933.

Phlox subulata L. var. australis Wherry.

Gattinger lists *Phlox subulata* but apparently did not know of its occurrence in Tennessee. He based his inference on collections of this species by J. K. Small on Kates Mountain, West Virginia. Recently (1929) Wherry, Jennison and others have collected it on shale hills near Lea Lakes, Grainger Co.

Conradina verticillata H. M. Jennison[2] (Syn. *C. montana*, Small[3]). Relic colonies in sandy banks along Clear Fork River, Fentress and Morgan Counties about one mile north of Rugby. Coll. July 14, 1930, *H. M. Jennison*, May 16, 1931; *H. M. Jennison and*

[1] Wherry, E. T. Bartonia No. 11 (1929).
[2] Jennison, H. M. Journ. Elisha Mitchell Sci. Soc. **48**: 268 (1933).
[3] Small, J. K. Manual of the Southeastern Flora (1933).

A. J. Sharp, May 28, 1932; *Mrs. Chas. Brooks;* May 28, 1933, *H. M. Jennison.*

The type specimen was destroyed in the Morrill Hall fire on 18th January, 1934. Isotypic specimens were collected May 31, 1934 by H. M. Jennison and A. J. Sharp.

Considerable exploring in this vicinity (Rugby) as well as in similar habitats in the region has failed to turn up other stations where this endemic grows.

Linaria canadensis (L.) Dumort. In clay soil of calcareous nature, Sequatchie Valley, near Dunlap, Sequatchie Co., May 3, 1931, *H. M. Jennison and A. J. Sharp.* (Specimens destroyed in Morrill Hall fire, Jan. 1934.)

A plant of the coastal plain province.

Gattinger reports the occurrence of this species in Tenn. He collected it at the summit of Lookout Mountain, July 8, 1880.

Fifty-one years later we found about an acre of farm garden near a house covered with specimens of the plant. This was at a lower elevation and at a place some miles farther north in Tennessee.

Penstemon brevisepalus Pennell.

"A new species of the Cumberland Plateau and country westward that I first saw at Crossville in 1923. This is to appear in Small's Manual of the Southeastern Flora, and also in my account of the Scrophulariaceae of Eastern North America."—F. W. Pennell's letter of Dec. 7, 1933.

Chelone glabra L. var. elongata P. & W. Wet woods in bottom land of the Mississippi embayment of Western Tennessee. *Pennell and Wherry.*[1]

Chelone obliqua L. "Found in wet wood and cypress swamps—throughout Western Tennessee," *Pennell and Wherry.*

Chelone montana var. elatior (Raf.) P. & W.

Pennell and Wherry say it is the most common typical Appalachian "Turtle head" along stream banks and swamps in mountain forests from northern Georgia to eastern Kentucky and southern Pennsylvania. In Tennessee (E. T. Wherry, letter of Nov. 29, 1933).

Pedicularis lanceolata Michx. In a swamp along U. S. Route 25E near Knox-Union Co. line. Oct. 15, 1933, *H. M. Jennison and A. J. Sharp.*

Indigenous in the north but reported from places as far south as Virginia and North Carolina. Now positively known to grow in

[1] Pennell, F. W. and Wherry, E. T. Bartonia, 1927–28.

Tennessee, though not common nor widely distributed, as far as we know.

SCHWALBEA AMERICANA L.

Gattinger reported this from Tullahoma; but there were no corroborative specimens in the Gattinger Collection in the University of Tenn. herbarium. "None of us who have looked for it in recent years have been able to rediscover it." E. T. Wherry, letter of Nov. 29, 1933.

SHERARDIA ARVENSIS L. Average sized specimens of this species were found growing in clay loam at border of recently seeded athletic field, University of Tennessee Campus, Knoxville, Knox Co. Discovered and collected by *Nina A. Shipe*, June 19, 1928.

EUPATORIUM VERBENAEFOLIUM Michx. Gattinger reports this as having been collected at "Hampton, East Tenn.," by the late Albert Ruth, but Gattinger left no specimens of it in his herbarium. However, by way of corroborating Gattinger's record, I can report its occurrence in East Tennessee, as follows: (1) East of Isabella, Polk Co., Sept. 15, 1930, *A. J. Sharp;* (2) Waste ground, rear of 1905 Prospect Place, Knoxville. *H. M. Jennison*, Sept. 1934.

ASTER SCHREBERI Nees. Shallow soil over dolomite rocks. Bluffs along Cedar Creek, Campbell Co., coll. July 4, 1933. *A. J. Sharp and J. K. Underwood.*

Heretofore distribution given as: New England to Michigan and Virginia.

ASTER TARDIFLORUS L. Wet limestone soil in woods. Bluff along Powell River near Arthur, Claiborne Co. Collected August 28, 1933. *A. J. Sharp and J. K. Underwood.*

HELIANTHUS ANGUSTIFOLIUS L. The "swamp sunflower" was long ago reported in Tennessee by Gattinger from "Craggy Hope, Cheatham Co., and in West Tenn.," but its occurrence on the Cumberland Plateau has not heretofore been recorded, as far as I know. Collected in an acid soil bog near Clark Range, Fentress Co., Oct. 13, 1934. *H. M. Jennison.*

CENTAUREA MACULOSA Lam. In sterile soil in abandoned field. Coll. Aug. 28, 1933, Speedwell, Claiborne Co., *A. J. Sharp and J. K. Underwood.*

CREPIS CAPILLARIS (L.) Wallr. Adventive from Europe; heretofore reported from Connecticut, New York, New Jersey, and Pennsylvania. Discovered growing in upper East Tennessee, summer 1933. In light soil, Shady Valley, 2800 ft. elev., Johnson Co., June 14, 1933, *A. J. Sharp and J. K. Underwood.*

THE UNIVERSITY OF TENNESSEE,
Knoxville.

CRITICAL PLANTS OF THE UPPER GREAT LAKES REGION OF ONTARIO AND MICHIGAN

M. L. Fernald

(*Continued from page 301*)

Epilobium paniculatum Nutt., var. **subulatum** (Hausskn.), comb. nov. *E. paniculatum,* forma *subulata* Hausskn. Mon. Gatt. Epilob. 247 (1884). *E. micranthum* Nutt. ex Hausskn. l. c. (1884), not Pall. ex Hausskn. l. c. 102 (1884). *E. Tracyi* Rydb. Bull. Torr. Bot. Cl. xl. 63 (1913). *E. subulatum* (Hausskn.) Rydb. l. c. 64 (1913). —Ontario: Colpoy's Bay, Bruce Co., 1871, *John Macoun;* Hopkins Harbor, Tobermory, Bruce Co., *Krotkov,* no. 7640; crevices and talus of hornblendic cliffs and ledges, Cloche Peninsula, Manitoulin District, no. 3440; about calcareous ledges in dry woods, south of Little Current, Manitoulin Island, no. 3441.

Var. *subulatum* is the extreme of the species about Lake Huron. Typical *Epilobium paniculatum* Nutt. described with "Flowers nearly as large as in E. palustre, pale red" has been collected farther east, along the Ottawa River in Quebec: Deschênes, 14 juillet, 1921, *Rolland,* no. 15,884. It is a coarser plant, with short pedicels and with calyx 5–6 mm. long, the petals longer. Var. *subulatum* was clearly described by Haussknecht (as forma *subulata*) "Floribus parvis,—5 m.m. longis, petalis calyce sublongioribus; calycis tubo brevi, glabro, 2 m. m. longo. Capsulis 2 c. m. longis, glabrescentibus . . . ; pedicellis capillaribus, 1/2: 1 c. m. longis"; etc. It is the small-flowered extreme of a highly variable cordilleran species; but, having long and slender pedicels, contrasted with the short and stouter ones of the large-flowered typical *E. paniculatum,* its identity is obscured by Rydberg's treatment, in setting up *E. subulatum* as a species:

. . . . . pedicels short . . . . . 2. *E. subulatum.*
. . . . . pedicels slender . . . . . 3. *E. paniculatum.*

E. Tracyi seems scarcely recognizable as different from *E. paniculatum,* var. *subulatum;* and I fully concur in the second half of Rydberg's statement, when he split *E. paniculatum* into "several forms or species," but all treated as species!, that *E. paniculatum* connects "on one hand with *E. minutum,* on the other with *E. jucundum.*" In defining his *E. paniculatum,* forma *subulata* Haussknecht included among the specimens cited Macoun's collection from Colpoy's Bay.

Chimaphila umbellata (L.) Bart., var. occidentalis (Rydb.) Blake, Rhodora, xix. 242 (1917). *C. occidentalis* Rydb. Michigan: woods, Mackinac Island, *Hunnewell,* no. 9329; openings and thickets back of crest of West Bluff, Keweenaw Co., no. 3458.

Var. *occidentalis* is the geographic variety (species of Rydberg) of the Pacific slope from British Columbia to north-central California, eastward into Montana, thence along the Rocky Mountains to Utah and Colorado. Its discovery in northern Michigan, where it is associated with scores of plants of similarly disrupted range, is at least a significant item.

Vaccinium membranaceum Dougl. in Hook. Fl. Bor.-Am. ii. 32 (1834) as syn.; Britton in Brit. & Br. Ill. Fl. ii. 576, fig. 2785 (1897), validation of the name. *V. myrtilloides*, β. *macrophyllum* Hook. l. c. (1834). *V. macrophyllum* (Hook.) Piper, Contrib. U. S. Nat. Herb. xi. 443 (1906).—The common "huckleberry" of the Upper Peninsula of Michigan is typical *V. membranaceum*, occurring otherwise only west of the continental divide from southwestern Alaska to northwestern Montana and the Coast Ranges of northern California. Its mature leaves are membranous, green on both sides, varying from lance-oval to ovate, acuminate above, 3–7 cm. long, 1.5–3.5 cm. broad. In central and eastern Washington and Oregon it passes gradually into a shrub with smaller leaves, 1–5 cm. long, 1–2.5 cm. broad, firmer, usually paler beneath and of an oblong to elliptic outline, with rounded to merely acutish (not long-acuminate) tips. This is

Var. **rigidum** (Hook.), comb. nov. *V. myrtilloides*, γ ? *rigidum* Hook. Fl. Bor.-Am. ii. 32 (1834). *V. globulare* Rydb. Mem. N. Y. Bot. Gard. i. 300 (1900).—Central Alberta (Lesser Slave Lake) and southern British Columbia to Colorado and Arizona. See p. 210 and map 7.

A specimen, sent by Hooker in 1835 to Jacques Gay and now in the Gray Herbarium, marked *Vaccinium myrtilloides* Hook. Fl. Bor.-Am. is the small-leaved shrub described by Rydberg as *V. globulare*.

Gentiana rubricaulis Schwein. Michigan: glades and openings in thickets bordering calcareous beach of L. Michigan, east of Manistique, no. 3482.

Gentiana rubricaulis, one of the most definite of species, has been quite misinterpreted. Gray, in 1878, partly understood it but he reduced it to varietal rank as *G. linearis*, var. *lanceolata* Gray, Syn. Fl. N. Am. ii.^{2} 123 (1878), giving a partially correct description of the true *G. rubricaulis* from "Minnesota along Lake Superior"; but adding "Also Herkimer Co., New York, *Paine*," the latter, as shown by his material, being merely a broadish-leaved *G. linearis* Froel. Subsequently, Gray partly cleared the situation, or perhaps further confused it, by publishing *G. linearis*, var. *latifolia* Gray, Proc. Am.

Acad. xxii. 309 (1887), for the "form from Lake Superior," adding the comment: "I have some reason to suppose that it is also *G. rubricaulis* of Schweinitz from the same region."

The segregation of *Gentiana linearis*, var. *latifolia* properly recognized the plant which is unquestionably what had been described as *G. rubricaulis* Schwein. in Keating's Narr. Long's Exped. ii. 384 (1824); but later authors (Britton and Robinson & Fernald) failed to clarify the situation, the former merging with *G. rubricaulis* the *G. linearis*, var. *lanceolata* from "central New York," the latter placing *G. rubricaulis* in the synonymy of var. *lanceolata*. Schweinitz's description was very clear and fragments of the type, presented many years ago to Asa Gray, show conclusively the identity of his species:

28. Gentiana * *rubricaulis*, L. v. Schw.

Though there were but two specimens of this Gentiana, (one of which I was under the necessity of sacrificing to the examination,) it presents so distinct an appearance that I have little doubt it will prove a new species, intermediate between *G. pneumonanthe* and *G. ochroleuca*. I describe it thus:

Stem erect, simple, terete, very smooth and firm, of a red colour; about one foot in height. *Leaves* about one inch in length, alternately opposite at intervals, oblong-lanceolate, of thick consistency, smooth, entire in margin and slightly undulate, obtuse, sessile and sub-amplexicaule or connate at base, with three nerves, the two lateral ones inconspicuous. The upper leaves forming a pseudo-involucrum of ovate leaves, not exceeding the corollas in length. Involucrum and leaves sub-erect. *Corollas* campanulate, erect, sessile, terminal, fasciculate or single, subquinquefid. Segments sub-connivent, the interior plait with a single tooth. *Calyx* very small in proportion to the flower, 5-fid.

Appears to have been bluish.

G. caule tereti glabro rubro: foliis oblongo-lanceolatis, trinerviis, obtusis. Corollis terminalibus fasciculatis sessilibus, 5-fidis campanulatis non ventricosis, laciniis acutis conniventibus; plicis interioribus unidentatis.

Hab. Prairies of St. Peter's river.

A detailed study shows that this characteristic plant of the Upper Great Lakes region, from western Ontario across northern Michigan to Minnesota, with isolated eastern outliers in Somerset Co., Maine and in Charlotte Co., New Brunswick, is quite distinct from *G. linearis*. The specific distinctness of the two was clearly recognized by Kusnezow who redefined the plants which are really *G. rubricaulis* as *G. Grayi* Kusnezow, Acta Hort. Petrop. xiii. 59 (1893), this later appearing as *Dasystephana Grayi* (Kusnezow) Britton in Britton & Brown, Ill. Fl. ed. 2, iii. 13 (1913), where Britton perpetuated the error of assigning *G. rubricaulis* to the synonymy of *G. linearis* and still further carried on the confusion by stating of his *D. Grayi* that

it is "Recorded from central New York." The record from central New York was, of course, that of Paine's broad-leaved (but quite frequent) extreme of *G. lincaris*, already discussed. *G. rubricaulis* seems to be particularly common on calcareous areas about Lake Superior and upper Lake Michigan.

Apocynum sibiricum Jacq., var. **cordigerum** (Greene), comb. nov. *A. cordigerum* Greene, Leafl. ii. 164 (1911). *A. Farwellii* Greene, l. c. 168 (1911). *A. hypericifolium* Ait., var. *cordigerum* (Greene) Bég. & Bel. Atti R. Accad. Lincei, V. ix. 114 (1913); Woodson, Ann. Mo. Bot. Gard. xvii. 141 (1930). *A. hypericifolium* Ait., var. *Farwellii* (Greene) Woodson, l. c. 140 (1930). Ontario: limestone pavement and gravel, Great Cloche Island, no. 3484.

Although Woodson treats var. *cordigerum* as a plant of the "upper Mississippi Valley," the representation in the Gray Herbarium shows it to be, likewise, in the drainage of the St. Lawrence and the Hudson to the east, and of the Saskatchewan to the northwest. Thoroughly characteristic specimens are before me from Indiana and Ohio, with a number from New York (south of Tripoli, Lake George region, July 5, 1914, *Burnham;* Newtown Pond, Junius, *Wiegand,* no. 3038; Westbury bog, Butler, *A. H. Wright,* no. 12,759). I am quite unable to see a distinct variety in *A. Farwellii.* Woodson treated it as a variety because it is "pubescent," but the specimens which I have seen (cited by him) have the hairs so few and so localized on the young growth that one must rake the specimens carefully with a lens to find them. In publishing *A. Farwellii* as a species Greene said: "main stem glabrous . . . up to the middle, above that, as also the branches, hirsutulous . . . leaves . . . all glabrous or nearly so above, sparsely fuscous-pubescent beneath." That was Greene's account of one individual, but there was another "in less pubescent, indeed almost glabrous state."

Woodson, quite misinterpreting the International Rules of Botanical Nomenclature, maintained the later name, *A. hypericifolium* Ait. Hort. Kew. i. 304 (1789), and rejected the clearly described and beautifully illustrated *A. sibiricum* Jacq. Hort. Vindob. iii. 37, t. 66 (1770). In apologizing for this irregular procedure he said:

> Jacquin published *A. sibiricum* nineteen years previous to the publication of *A. hypericifolium* Ait. Moreover, the description of the former was accompanied by a full-page folio illustration of the habit of the plant. The Latin description of the former, also, was far more elucidating than the unillustrated and terse description of Aiton. However, as can be quickly perceived by a glance at the citations in literature on page 133, botanists were quick to take up *A. hypericifolium* Ait., while *A. sibiricum*

Jacq., perhaps because of the misleading geographical adjective, was disregarded for over a hundred years after its publication. In such a case, the practical course is to follow the so-called "Fifty year rule" tacitly established in the International Code of Nomenclature, and adopt the better-known designation.[1]

Although the motive, to reject an inappropriate name in favor of an appropriate one (as was done by many authors in the days before our existing rules of nomenclature) is commendable, it is certainly difficult to find anything in the International Rules or any other code about a "Fifty year rule" for species. The author doubtless had vaguely in mind the old "Berlin rule," which was the basis for the original list of *nomina generica conservanda.* No specific names are free from the priority principle.

Typical *Apocynum sibiricum* of Jacquin was the erect form, so illustrated and clearly described "Caules annui, erecti . . . sesquipedales." On the sands and gravels of much of Canada and the adjacent states it is quite prostrate, and erect plants are absent or difficult to find. This is

A. SIBIRICUM Jacq., forma **arenarium** (F. C. Gates), comb. nov. *A. hypericifolium*, prostrate, Schaffner, Ohio Nat. x. 184, fig. 1 (1910). *A. hypericifolium*, f. *arenarium* F. C. Gates, Torreya, xi. 128 (1911).

The western American *Apocynum sibiricum* is superficially like the typical plant, in having the middle leaves narrowly oblong to oblong-lanceolate, acute and with merely rounded to cordate bases (instead of oval or broadly ovate-oblong, rounded or obtuse or merely subacute and with cordate-clasping bases as in var. *cordigerum*), but this western extreme has more slender corolla-tube than typical *A. sibiricum* and the coma of the seed is longer. This is

A. SIBIRICUM Jacq., var. **salignum** (Greene), comb. nov. *A. salignum* Greene, Pittonia, v. 64 (1902). *A. hypericifolium*, var. *salignum* (Greene) Bég. & Bel. l. c. 115 (1913); Woodson, l. c. 141 (1930).

HACKELIA DEFLEXA (Willd.) Opiz, var. AMERICANA (Gray) Fern. & Johnst. RHODORA, xxvi. 124 (1924). MICHIGAN: borders of open woods north of Garden, Delta Co., and on shaded talus of limestone cliff, Burnt Bluff, Delta Co., nos. 3491, 3492.

Previously recorded, either as *Lappula americana* (Gray) Rydb. or *L. deflexa* (Willd.) Garcke from Cheboygan Co.

MERTENSIA PANICULATA (Ait.) G. Don, var. SUBCORDATA (Greene) Macbride. MICHIGAN: brookside in woods, south of L'Anse, Baraga Co., no. 3493.

[1] Woodson, *A Monograph of the Genus Apocynum.* Ann. Mo. Bot. Gard. xvii. 139 (1930).

In his *Studies in the Boraginaceae, IX*, Contrib. Arn. Arb. iii. 85 (1932), Johnston restricts var. *subcordata* to Washington, Oregon and Idaho. Our material, which he identifies without question as var. *subcordata*, adds another to the long series of identities in the floras of the Pacific slope and of the Upper Great Lakes.

Lithospermum **croceum**, sp. nov. (tab. 376, figs. 1–5). Perenne e radice longe et recte descendenti; caulibus 1.5–6 dm. altis pilosis; foliis subuniformibus lineari-oblongis vel lanceolatis obtusis vel subacutis adscendentibus plerumque 33–45 infra inflorescentiam, majoribus 2–5 cm. longis 3–15 mm. latis utrinque papilloso-hispidis pilis ca. 1 mm. longis; racemis floriferis dense corymbis 3–8 cm. diametro, racemis fructiferis elongatis 1–2 dm. longis strictis; bracteis late lanceolatis vel ovatis foliis similibus calices maturos valde superantibus fructiferis imbricatis; floribus breve pedicellatis; lobis calicis lanceolato-acuminatis valde carinatis papilloso-hispidis fructiferis 10–15 mm. longis; corollis croceis extus pilosis, tubo infundibuliformi exserto ad basin contracto poro minuto intus glabro basi barbato excepta, limbo 1.5–2 cm. diametro lobis oblongo-rotundatis opacis venis confluentibus; fauce vix vel breve appendiculato; staminibus inclusis, filamentis quam antherae oblongae brevioribus; nuculis albidis lucidis 3.5–4 mm. longis.—Sands, gravels and sandy woods, thickets and bluffs near the Great Lakes from western New York and Ontario westward, thence to Montana, South Dakota, Nebraska and Kansas. Type: calcareous sand back of beach of Lake Michigan, east of Manistique, Michigan, July 9, 1934. *Fernald & Pease*, no. 3494 (in Gray Herb.).

Lithospermum croceum is the plant of the sands of the Great Lakes region and of the plains westward and southwestward to Montana, South Dakota, Nebraska and Kansas which long passed as *L. hirtum* (Muhl.) Lehm., then as *L. Gmelini* (Michx.) Hitchc. and more recently as *L. caroliniense* (Walt.) MacMill. Those are all synonymous names and they go back for their typification to *Anonymos caroliniensis* Walt. Fl. Carol. 91 (1788), a characteristic species of the coastal plain from South Carolina to Florida, thence to eastern Texas and adjacent Mexico, Arkansas and Oklahoma.

The southern coastal plain species is finely pilose, the hairs of stem and foliage (fig. 6) much more abundant and less papillose-based than in the inland and more northern species, the lower cauline leaves very much smaller than the middle and upper, the latter well developed leaves only 15–25 below the branching inflorescence, with the midrib dorsally minutely pilose; the branches of the mature inflorescence are loosely ascending or spreading, with the bracts becoming distant; the mature calyx (fig. 7) is slender-pedicelled, the pedicels ultimately

1/3–2/3 as long as the calyx, and the calyx-lobes are flat, with slender midrib and villous (instead of papillose)-hispid; the corolla is larger, paler, and of thinner texture, the limb 2–2.5 cm. broad, the throat with elongate appendages, the outside minutely appressed- or sericeous-pilose, the tube minutely pilose within, the veins (fig. 8) continuing without evident anastomosing into the lobes. This southern species was first described as *Anonymos caroliniensis* Walt. Fl. Carol. 91 (1788). It was promptly renamed *Batschia caroliniensis* Gmel. Syst. i. 315 (1791) and, in the same year, *Lithospermum carolinianum* Lam. Tab. Encyc. i. 397 (1791). Somewhat later, with the probable desire to honor Gmelin for giving a generic identification to Walter's *Anonymos caroliniensis* and with complete disregard for the principle of priority which later became so important, it appeared as *Batschia Gmelini* Michx. Fl. Bor.-Am. i. 130 (1803). Yet again, regardless of the older and properly published names, Lehmann picked up a *nomen nudum* of Muhlenberg's—*Anchusa hirta* Muhl. Cat. 19 (1813)—and described *Lithospermum hirtum* Lehm. Asperif. ii. 304 (1818) from South Carolina, with the names of Walter, Gmelin and Michaux all cited as synonyms. As if this beautiful species of the southern coastal plain had not been sufficiently named, Rafinesque got it from Florida and described it as *L. strigosum* Raf. New Fl. N. Am. pt. iv. (Neobotanon), 18 (1836) and Alphonse DeCandolle, from a very inadequate Texan specimen, described it as *L. bejariense* A. DC. Prodr. x. 79 (1846). When two of the older names were transferred as *L. caroliniense* (Walt.) MacMillan, Metasp. Minn. Val. 438 (1892) and as *L. Gmelini* (Michx.) Hitchc., Spring Fl. Manhattan, 30 (1894), their authors had before them local material of *L. croceum*. Nomenclaturally, however, their combinations finally rest upon *Anonymos caroliniensis* Walter from South Carolina.

Yet the quite distinct northern and inland plant was regularly confused with the southern species and among the surplus of names proposed I can find none which designates it; nearly every one was content to rename the plant of South Carolina which Walter had originally described. In its very harsh pubescence *L. bejariense* A. DC. from eastern Texas, an isotype of which is before me, suggests *L. croceum*, but *L. bejariense* has the abruptly smaller lower leaves, the scattered fruiting bracts, the plane calyx-lobes and the characteristic venation of throat and lobes of the corolla of *L. caroliniense;* and it is apparently a variation of the latter species, to which it was properly assigned by Johnston, Contr. Gray Herb. lxx. 31 (1924).

PLATE 376, FIG. 1 shows a small flowering plant, × 1/2 from the TYPE collection of *Lithospermum croceum;* FIG. 2, the top of a fruiting plant, × 1/2, from Illinois; FIG. 3, a portion of the back of a bract, × 10, of the type, to display characteristic pubescence; FIG. 4, a fruiting calyx, × 3, to show the keel and the stiff ciliation of the calyx-lobes; FIG. 5, the venation of the opaque corolla-lobe, × 10, cleared for photographing by boiling in alcohol and then mounting in glycerine. The other figures, representing details of *L. caroliniense,* are noted in a preceding paragraph.

HEDEOMA HISPIDA Pursh. MICHIGAN: sand plain south of Iron Mountain, Dickinson Co., no. 3501.

Beal cites only a single station, near the southeastern corner of the state.

COLLINSIA PARVIFLORA Lindl. To the stations already recorded from the Keweenaw Peninsula add: wind-swept crests, crevices and talus of sandstone-conglomerate, West Bluff, Keweenaw Co., nos. 3512 (large, still flowering on July 4), 3513 (small, with capsules open).

MIMULUS MOSCHATUS Dougl. To the records from northern Michigan add: seepy bank in rich, deciduous woods, Delaware, Keweenaw Co., no. 3514.

Farwell had already collected *Mimulus moschatus* at Delaware in 1885 (his no. 277, from banks of brooks and moist places, "Indigenous to the Keweenaw Peninsula." He made a similar memorandum on his no. 5975 from streams near Lake Linden. In northern Michigan as elsewhere in the East, notably in Newfoundland and on the Magdalen Islands, the species seems to be indigenous.

VERONICA SCUTELLATA L., var. VILLOSA Schumacher. ONTARIO: by pool in argillaceous swale near Warren, Sudbury District, no. 3517.

In RHODORA, xxiii. 38 (1921) Pennell reduces the pubescent plant to formal rank, as forma *villosa* (Schumacher) Pennell, and states that it "occurs sporadically occasional throughout the range of the species." It may be so, but in nearly fifty years of intimate knowledge of *V. scutellata* in the area from Labrador and Newfoundland to western New York and Virginia, I had never seen the pubescent plant growing until I went to Lake Huron in the summer of 1934. In the very extensive collections of the Gray Herbarium and of the New England Botanical Club it is not represented from Labrador, Newfoundland, the Maritime Provinces, Quebec and New England, whence it should have been collected if present. All the material in the Gray Herbarium is from the Great Lakes area and the Puget

Sound area (western New York to Lake Superior; southwestern British Columbia, Vancouver Island and northwestern Washington). This range is so nearly identical with that of many other plants of the Great Lakes region that I am inclined to retain var. *villosa* as a geographic variety. When John Macoun described it as var. *pubescens* Macoun, Cat. i. 361 (1884) he knew it only from Belleville on Lake Ontario, saying: "It is the only form found there." This was the case, likewise, at the pool in Warren.

Utricularia geminiscapa Benj. (*U. clandestina* Nutt.). Michigan: pools with *Potamogeton Oakesianus* Robbins, *Eleocharis Robbinsii* Oakes, *Eriocaulon septangulare* With., *Drosera intermedia* Hayne, etc. in bog near Rock River, Alger Co., no. 3521.

Perhaps the first record from Michigan; already known in Wisconsin.

Plantago Purshii R. & S. Michigan: sandy open pine barrens north of Gladstone, Delta Co., no. 3524.

Apparently the first record from the Upper Peninsula. The plant seemed to be a part of the indigenous flora.

Lonicera villosa (Michx.) R. & S., var. Solonis (Eaton) Fernald, Rhodora, xxvii. 6 (1925). Michigan: arbor-vitae swamp near Eckerman, no. 3527.

When I studied the variations of *Lonicera villosa*, I had var. *Solonis* from Isle Royale but not from the mainland of Michigan.

Virburnum affine Bush. Michigan: wind-swept crests, crevices and talus of sandstone-conglomerate, West Bluff, Keweenaw Co., no. 3537.

When Blake, Rhodora, xx. 14 (1918), divided *Virburnum affine*, he recognized the glabrous-leaved typical form from Ontario, Illinois, Minnesota, etc., but not from Michigan; the Michigan shrub recognized by him being var. *hypomalacum* Blake, l. c.

Aster nemoralis Ait. Michigan: larch swamp near Emerson, Chippewa Co., no. 3550.

Although Beal lists *Aster nemoralis* as "Common Th [roughout]," I find no other record of it from Michigan, nor has a specimen from so far west previously reached the Gray Herbarium.

Antennaria rupicola Fern. See Rhodora, xxxv. 342, 343, map 26, where no stations were indicated on the Great Lakes, except at the northwest side of Lake Superior. The following are more easterly. Ontario: limestone pavement and gravel, Great Cloche Island, Manitoulin District, no. 3556; dry soil, Jack Fish, Thunder Bay Distr., *Pease & Bean*, no. 23,475; roadside, Schreiber, *Pease & Bean*, no. 23,597.

Adenocaulon bicolor Hook. To the comparatively few recorded stations about the Upper Great Lakes add: Ontario: Cape Croker, Indian Peninsula, Bruce Co., July, 1895, *A. Y. Massey* (Can. Nat. Herb.). Michigan: deciduous woods between Rock River and Sand River, Alger Co., no. 3562; rich, deciduous woods (with *Polystichum Lonchitis*), Delaware, Keewenaw Co., no. 3563. See p. 210 and maps 8 and 9.

Coreopsis lanceolata L. Ontario: in great profusion and very showy on talus of hornblendic cliffs and ledges, Cloche Peninsula, Manitoulin Distr., no. 3564.

This station (very extensive) is recorded, since Macoun (Cat.) cited only vague and somewhat general areas, without definite localities.

C. lanceolata, var. villosa Michx. Michigan: sandy barrens west of Norway, Dickinson Co., no. 3566.

Apparently not recorded from north of Illinois.

The Varieties of Tanacetum huronense (Plates 377 and 378). —The native tansy of eastern North America occurs in five widely segregated areas. The typical plant, described by Nuttall from "sandy shores of Lake Huron, near Michilimakinak; abundant," occurs on the sands and gravels of Lakes Huron, Superior and Michigan. Never properly represented in the Gray Herbarium, the Great Lakes plant has been considered inseparable from the plant of the St. John valley in Quebec, New Brunswick and Maine and the adjacent (and formerly confluent) valley of the Restigouche, a plant abundantly represented in the Gray Herbarium and the herbarium of the New England Botanical Club. Our collection of the typical Great Lakes plant is now, happily, augmented and it is clear that the isolated plant of the St. John and Restigouche valleys is a strongly marked geographic variety. Farther east, on the river-gravels of Anticosti, the plant combines the characters of the typical Great Lakes variety and that of the St. John and the Restigouche, while the plant from dunes of James Bay and eastern Hudson Bay seems to be that of Anticosti. Farthest east, the usually monocephalous and densely lanate plant of the west coast of Newfoundland, var. *terrae-novae*, exhibits the most extreme departure from the type of the species.

The characters of these four geographic varieties of *Tanacetum huronense* are briefly stated below and the plates bring out the essential differences.

a. Flowering stem 4–8 dm. high, with 7–15 green leaves: corymb with 6–30 heads: leaves oblong, with oblong to oblanceolate pinnae . . . . . Var. *typicum*.

a. Flowering stem 0.4–4.5 dm. high: corymb with 1–6 heads . . . . *b*.

b. Leaves oblong to narrowly elliptic, the larger 4–10 cm. long, 2–5 cm. broad; the pinnae oblong to oblong-oblanceolate, blunt, with approximate to imbricated pinnules . . . . *c*.

c. Flowering stems 1.2–3 dm. high, glabrous to sparingly pilose (except at summit), with 4–10 green and sparsely pilose leaves above the basal rosette: heads 2–6 . . . . . Var. *bifarium.*

c. Flowering stem 0.4–2 dm. high, copiously lanate, with 1–4 white-lanate leaves above the basal rosette: heads 1 or 2 (rarely –4) . . . . . Var. *terrae-novae.*

b. Leaves (especially the basal and median) elliptic, the larger 1–3 dm. long, 0.35–1.4 dm. broad; pinnae remote, with remote simple to much dissected acute pinnules: flowering stems 2–4.5 dm. high, with 5–10 leaves and 1–5 heads. Var. *johannense.*

T. HURONENSE Nutt., var. **typicum** (PLATE 377, FIGS. 1 and 2). *T. huronense* Nutt. Gen. No. Am. Pl. ii. 141 (1818).—Sands and gravels of Lakes Huron, Michigan and Superior.

Var. **bifarium**, var. nov. (TAB. 377, FIGS. 3 et 4), var. *typico* similima a qua differt caulibus 1.2–3 dm. altis glabris vel sparse pilosis; foliis caulinis 4–10 sparse pilosis oblongis vel anguste ellipticis majoribus 6–10 cm. longis 2–5 cm. latis, pinnis oblanceolatis obtusis, pinnulis obtusis; capitulis 2–6.—Anticosti Island, QUEBEC: sur les platières de l'embouchure, Rivière Jupiter, 10 août 1926, *Victorin & Rolland*, no. 25,177; sur les platières au-dessus des gorges, Rivière Chicotte, 15 août 1926, *Victorin & Rolland*, no. 25,176; sur les platières, R. des Caps, 25 juillet 1927, *Victorin & Rolland*, no. 27,566; sur les platières argilo-calcaires, avec *Solidago Victorinii*, R. McKane, 30 juillet 1927, *Victorin & Rolland*, no. 27,564 (TYPE in Gray Herb.). UNGAVA DISTR.: east coast of Hudson Bay, Smith Sound, August 24, 1928, *Malte*, no. 120,894; sandy shore of Hudson Bay, Port Harrison, August 18–20, 1928, *Malte*, no. 120,720; sand dunes near the Post, Charlton Island, July 6, 1929, *David Potter*, no. 25.

Var. TERRAE-NOVAE Fernald, RHODORA, XXV. 14 (1923). PLATE 378, FIGS. 1–4. Peaty turfy or gravelly limestone barrens of western Newfoundland, in typical development from the shore of Pistolet Bay to Ingornachoix Bay; the plant of Cape St. George approaching var. *bifarium.*

Var. **johannense**, var. nov. (TAB. 378, FIGS. 5 et 6), foliis imis mediisque late ellipticis majoribus 1–3 dm. longis 0.35–1.4 dm. latis, pinnis remotis, pinnulis remotis acutis simplicibus vel valde dissectis; caulibus 2–4.5 dm. altis; foliis caulinis 5–10; capitulis 1–5.—Gravels and sands of the St. John River and tributaries, Quebec, Maine and New Brunswick, and of the Restigouche River, New Brunswick and Quebec. TYPE: river-gravels and shingly border of thicket by the St. John River, Woodstock, New Brunswick, July 14, 1916, *Fernald & Long*, no. 14,860 (TYPE—four sheets—in Gray Herb.).

ARNICA (CORDIFOLIAE) **Whitneyi**, sp. nov. (TAB. 379, FIGS. 1–5), rhizomate gracili perlongo horizontali vel subadscendente stolonifero; caule solitario 1.7–4 dm. alto sparse villoso, pilis albidis ad 2 mm. longis glandulis minutis commixtis; foliis basilaribus late ovatis vel subrotundatis membranaceis utrinque sparse pilosis 5.5–10 cm. longis 4.5–8 cm. latis, basi valde cordatis sino angusto, margine remote

breviterque serrato-dentato, apice subacuto vel rotundato, petiolo gracile 6–12 cm. longo glanduloso-villoso; foliis caulinis 2–3-jugis, imis longe petiolatis basilares simulantibus, mediis similibus breviter petiolatis basi cordatis vel subcordatis, superioribus reductis ovatis vel lanceolatis subintegris acutis basi rotundatis sessilibus vel breve petiolatis; pedunculis 1–3 nudis vel bracteatis, bracteis lineari-lanceolatis caudato-attenuatis; capitulis 2.5–5 cm. diametro; involucro 1.2–1.8 cm. alto basi dense albido-villoso supra glanduloso laxeque villoso; bracteis 8–12 lineari-oblanceolatis 2–3 mm. latis apice deltoideo-acuminato; ligulis luteis, lamina 1.2–1.8 cm. longa 4–6 mm. lata 7–9-nervata apice breviter 3-dentata dentibus vix 1 mm. longis; corollis disci 8 mm. longis, tubo villoso 3–4 mm. longo basi obcupuliformi, cupula glabra 0.6–0.7 mm. alta; achaeniis nigris 7 mm. longis strigoso-hirsutis basi anguste albido-annulatis, annulo 0.1 mm. lato; pappo albido 8–11 mm. longo, setis barbellulatis.—Keweenaw County. MICHIGAN: Copper Harbor, 1849, *W. D. Whitney* in Gray Herb.; dry deciduous woods near Copper Harbor, July 4, 1934, *Fernald & Pease*, no. 3579 (TYPE in Gray Herb.); dry, deciduous woods at base of greenstone and calcareous conglomerate bluffs, east of Eagle Harbor, July 6, 1934, *Fernald & Pease*, no. 3580.

Arnica Whitneyi, as beautiful a plant as any in the genus, is named for its discoverer, WILLIAM DWIGHT WHITNEY, 1827–1894. In his report on Botany in Foster, J. W., and Whitney, J. D., Rep. Geol. Lake Superior Land District, ii. Chap. xxi, 368 (1851), W. D. Whitney recorded it as *A. mollis* Hook. from Copper Harbor; and his material (the upper half of a plant preserved in the Gray Herbarium) has been the basis of subsequent reports of *Arnica* from Michigan: as *A. Chamissonis* of Gray, Man. ed. 2, issue of 1859, and later eds., from Lake Superior, and of Beal & Wheeler's Michigan Flora; as *A. lanceolata* of Britton, Man. and of Beal, Flora of Michigan; as *A. cordifolia* of Fernald, RHODORA, vii. 150, from Copper Harbor (*Whitney*) and of Robinson & Fernald in Gray, Man. ed. 7; as *A. mollis* of Britton in Britton & Brown, Ill. Fl. ed. 2, from Lake Superior.

The white, merely barbellulate pappus of the fragmentary Whitney specimen clearly separates his plant from *Arnica Chamissonis* Less. and *A. mollis* Hook. (including *A. lanceolata* Nutt.) which have brownish or olivaceous plumose pappus. The beautiful new material, with characteristic basal leaves, shows that the relationship of *A. Whitneyi* is with *A. cordifolia* Hook. and its cordilleran segregates. The Keweenaw plant, however, seems very distinct from *A. cordifolia* and its described allies.

In typical *A. cordifolia* (FIGS. 6–9), as shown by an authentic specimen sent by Hooker in 1835 to Jacques Gay and now preserved

in the Gray Herbarium (Hooker had published the species in 1834) and by a large series of specimens from the cordilleran region, the basal leaves are merely cordate, subcordate or subtruncate at base, with broad and open sinuses, and the marginal teeth are very coarse; the middle and upper cauline leaves are mostly deltoid-ovate, the upper sometimes rhombic, and with prolonged tips; and the pubescence of the stem, peduncles and involucres rarely shows much of the glandular admixture which is so abundant on and which gives a heavy, oily odor to *A. Whitneyi*. In *A. cordifolia* the involucral bracts (FIG. 6) are usually more broadly oblanceolate than in *A. Whitneyi* (FIG. 2) and without the abundant glands on the surface; the ligules (FIG. 7) are broader (up to 1 cm. broad), with sharper and longer terminal lobes (the longer 1.5–3 mm. long); the disk-corollas (FIG. 8) are coarser (9–11 mm. long), the tube with a conical, rather than inverted-cuplike base; and the slightly coarser achenes (FIG. 9) have the basal annulus heavier and thicker.

These numerous characters, though largely of degree, set the Keweenaw plant off so definitely from its cordilleran allies that it seems better to treat it as a species than as an isolated variety which differs in ten or more recognizable characters. Its nearest relationship is certainly with *Arnica cordifolia;* the other recognized members of the *Cordifoliae* (all cordilleran) are more remote from it. In Keweenaw County *A. Whitneyi* was closely associated with the ubiquitous *Aster macrophyllus* L. Where the Arnica made large patches of sterile shoots with their characteristic foliage, it was necessary to exercise caution not to collect rosettes of the Aster!

In view of the discovery of *Arnica Whitneyi* in 1849 by the young botanist who then was dividing his interest between natural history and philology, later to become one of our most distinguished philologists,[1] it is most appropriate that the rediscovery of this beautiful

[1] In 1849, WILLIAM DWIGHT WHITNEY went as botanist on the Lake Superior expedition of his older brother, Josiah Dwight Whitney. "Up to this time, as has already been intimated, his interests lay mainly in the direction of the natural sciences. But an event was now about to occur which was destined to change the course of his studies and to determine his whole future. In 1847, his elder brother, Professor J. D. Whitney, had returned from Germany, where he had been devoting himself to the science [geology] in which he has become distinguished. Yet while there he had not limited his attention to it, but had given up a good deal of time to language. Among the books he brought back with him was a copy of the second edition of Bopp's Sanscrit Grammar. This work attracted the attention of his younger brother, and aroused a keener interest than he had before felt in any particular subject. In the winter of the following year he began the systematic study of Sanscrit. For him this was the parting of the ways. In June, 1849, indeed, he joined an expedition sent out by the United States government to explore the region about Lake Superior. One of its two directors was his elder brother, and to the future philologist were assigned

plant should have been shared by a later distinguished philologist, Arthur Stanley Pease, who finds his chief diversion in botany.

CIRSIUM PALUSTRE (L.) Scop. MICHIGAN: border of wet woods, Lawson, Marquette Co., no. 3582; low woods, Michigamme, no. 3583; and seen in similar habitats to Houghton Co.

Cirsium palustre in northern Michigan is either indigenous (as it appears to be in Newfoundland)[1] or, if introduced, has remarkably succeeded in selecting habitats where it simulates indigenous species. Its behavior in Michigan (whether it suddenly spreads or remains quiescent) should be watched.

KRIGIA BIFLORA (Walt.) Blake, forma **glandulifera**, f. nov., pedunculis superne glanduliferis.—With or apart from the typical glabrous-peduncled form of the species. TYPE: dry sandy spruce and pine barrens near Humboldt, Michigan, July 3, 1934, *Fernald & Pease*, no. 3584, in Gray Herb.

Typical *Krigia biflora* (Walt.) Blake, RHODORA, xvii. 135 (1915), has glabrous peduncles. So far as shown in the Gray Herbarium all the specimens from New England to West Virginia are without glands. Some from Kentucky, North Carolina and Tennessee have glandular peduncles; others, often of the identical collection (on the same sheet) are glandless. In the Great Lakes region, thence westward to Colorado, glandular peduncles occur on about one-third of the specimens in the herbarium. Here, again, glabrous and glandular peduncles are sometimes on the same sheet. All the material we saw in northern Michigan had the glands well developed. I cannot, however, look upon these plants as more than a recognizable form. They surely are not a separate species. Upon the collection of Bronson Barlow from Turin, Marquette Co., Michigan, June 21, 1901, was based *Cynthia falcata* Standley, Contrib. U. S. Nat. Herb. xiii. 356 (1911). One of the Barlow sheets is before me and I cannot separate it from much typical *Krigia biflora* except in glandular peduncles. Standley, in publishing *Cynthia falcata*, separated it solely on the "prominently aquiline-serrate upper leaves," the upper leaves of *Cynthia virginica*

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the barometrical observations, the botany, and the charge of the accounts. But he took with him also his copy of Bopp, and the leisure moments he enjoyed during the expedition were, as far as possible, devoted to the fuller study of that work."—T. R. Lounsbury, *William Dwight Whitney*, Proc. Am. Acad. xxx. 580, 581 (1895).

In view of the frequent assumptions that W. D. Whitney, botanist of the Lake Superior expedition of 1849, was really J. D. Whitney, the distinguished geologist (the "W" being considered a misprint), and since the botanical report is entered in bibliographies merely under W. D. Whitney, the above excerpt from Professor Lounsbury's sketch is quoted as satisfactorily clearing the identity.

[1] See Fernald, RHODORA, xxxv. 15 and 369 (1933).

(*Krigia biflora*) said to be entire. In his proposed new species the "fruit is as in *C. virginica* . . . A very different plant . . . , readily distinguished by the peculiar toothing of its leaves."

In the Barlow sheet in the Gray Herbarium the uppermost leaves (bracts) are entire, but the median and lower leaves have prominent divergent to curving variable teeth. Such teeth are seen on our collection from Gladstone, Michigan (*F. & P.*, no. 3585) which, accordingly, would be *Cynthia falcata*. They occur on numerous other specimens with glandular peduncles and upon many with the peduncles glabrous: from Southbury, Connecticut; Mohegan, New York; Mount Bethel, Pennsylvania; Webster Co., West Virginia; Milwaukee, Wisconsin; Rantoul, Illinois, etc. The character depended upon by Standley as his fundamental specific one is too fickle. The plants with strongly developed glands are at least recognizable and may have some ecological significance. To take up Standley's specific epithet *falcata* to designate a *glandular* form would be quite misleading and is wholly unnecessary. Similarly, to take up for a glandular form of nearly transcontinental range the name *C. viridis* Standley, l. c. 357 (1911), given to the plants of New Mexico and Arizona (occurring also in Colorado) because of a reputed greener color, would be inappropriate. Consequently, I have given a new name and have designated a different type.

EXPLANATION OF PLATES 352–380

PLATES 352–354. Sufficiently explained in the legends.

PLATE 355. PHYLLITIS SCOLOPENDRIUM (L.) Newm.: FIG. 1, frond, × ½, from Larmor's Glen, Dundonald, Ireland, August 12, 1884, *R. L. Praeger;* FIG. 3, portion of stipe, × 10, from Ennis, Co. Clare, Ireland, *Tidestrom*, no. 11,256; FIG. 5, margin of fond, × 10, from Savoy, ex herb. Thurber.

P. SCOLOPENDRIUM var. AMERICANA, n. var.: FIG. 2, frond, × ½, from Perryville, Madison Co., New York, August, 1903, *House;* FIG 4, portion of stipe, × 10, from Ingalls Falls, Grey Co., Ontario, *Fernald*, no. 3040 (TYPE); FIG. 6, margin of frond, × 10, from White Lake, east of Jamesville, New York, *Wiegand*, no. 5374.

PLATE 356. CRYPTOGRAMMA CRISPA (L.) R. Br., var. ACROSTICHOIDES (R. Br.) C. B. Clarke: reproduction of original plate of *C. acrostichoides* in Hooker & Greville, Icones Filicum, i. t. xxix.

PLATE 357. CRYPTOGRAMMA CRISPA, var. BRUNONIANA (Wallich) Fern.: reproduction of original plate of *C. Brunoniana* in Hooker & Greville, Icones Filicum, ii. t. clviii.

PLATE 358. PTERIDIUM AQUILINUM (L.) Kuhn, var. LANUGINOSUM (Bong.) Fern., forma DECIPIENS (Lawson) Fern.: portion of plant, × ⅗, from Caribou Hill, Black Lake, Megantic Co., Quebec, *Fernald & Jackson*, no 11,961.

PLATE 359. FESTUCA OVINA L.: FIG. 1, panicle, × 1, from Glåmos, Norway, 1925, *Dyring;* FIG. 2, spikelet, showing anthers, × 5, from Forked River, New Jersey, May 27, 1891, *J. R. Churchill.*

F. OVINA, var. DURIUSCULA (L.) Koch: FIG. 3, pancile, × 1, from Cambridge,

Massachusetts, June 8, 1884, *Walter Deane;* FIG. 4, spikelet, showing anthers, × 5, from Albany, New York, June 6, 1912, *S. H. Burnham.*

F. SAXIMONTANA Rydb.: FIG. 5, panicle, × 1, from Jack Fish, Thunder Bay Distr., Ontario, *Pease & Bean*, no. 23,332; FIG. 6, spikelet, showing anthers, × 5, from no. 23,332.

F. BRACHYPHYLLA Schultes: FIG. 7, panicle, × 1, from Craig Harbor, Ellesmere Island, *Malte*, no. 118,370; FIG. 8, spikelet, showing small anther, × 5, from Craig Harbor, Ellesmere Island, *Malte*, no. 118,372.

F. SUPINA Schur: FIG. 9, spikelet, showing anthers, × 5, from Petrak, Fl. Bohem. et Morav. Exsicc. no. 717.

F. VIVIPARA (L.) Sm.: FIG. 10, panicle, × 1, from Little Quirpon, Newfoundland, *Wiegand, Gilbert & Hotchkiss*, no. 27,385; FIG. 11, spikelet, showing awnless lemmas, × 5, from no. 27,385.

F. CAPILLATA DC.: FIG. 12, panicle, × 1, from Grand Falls, Newfoundland, *Fernald & Wiegand*, no. 4669; FIG. 13, spikelet, showing anthers, × 5, from Murray's Pond, Newfoundland, 1931, *A. M. Ayre.*

PLATE 360. CAREX GARBERI, n. sp.: FIG. 1, small plant, × 1, from Manistique, Michigan, *Fernald & Pease*, no. 3183; FIG. 2, orifice of sheath, × 5, from no. 3183; FIG. 3, spike, showing obtuse scales, × 5, from no 3183; FIG 4, staminate base of terminal spike, showing obtuse scales, × 5, from Presque Isle, Pennsylvania, June 9, 1869, *Garber* (ISOTYPE); FIG. 5, denuded rachis, × 10, from *Fernald & Pease*, no. 3183; FIG. 6, perigynium, × 10, from ISOTYPE.

C. GARBERI, var. BIFARIA, n. var.: FIG. 11, portion of plant, × 1, from River Ste. Anne des Monts, Quebec, August 3–17, 1905, *Collins & Fernald* (TYPE); FIG. 12, perigynium, × 10, from TYPE.

C. HASSEI Bailey: FIG. 7, portion of spike, showing sharp scales, × 5, from San Bernardino, California, *S. B. Parish*, no. 5219; FIG. 8, staminate base of terminal spike, showing large, acute scales, × 5, from no. 5219; FIG. 9, orifice of sheath, × 5, from no. 5219.

C. AUREA Nutt.: FIG. 10, portion of spike, to show distant flowers, × 5, from Charlotte, Vermont, June 12, 1878, *F. H. Horsford.*

PLATE 361. ZIGADENUS GLAUCUS Nutt.: FIG. 1, flowering plant, × ⅔, from Scotty Bay, Mackinac Co., Michigan, *Ehlers*, no. 648; FIG. 2, portion of inflorescence, showing firm bracts, × 2, from L'Anse Pleureuse, Gaspé Co., Quebec, *Kelsey & Jordan*, no. 55; FIG. 3, capsule, × 2, from Cap Blanc, Percé, Quebec, *Collins, Fernald & Pease* (*Pease*, no. 5567).

Z. ELEGANS Pursh: FIG. 4, flowering plant, × ⅔, from mountains (at 10,500 ft.) near Cottonwood Lake, Lincoln Co., Wyoming, *Payson & Armstrong*, no. 3774; FIG. 5, portion of inflorescence, showing scarious bracts, × 2, from Leeds, North Dakota, July 3, 1899, *Lunell;* FIG. 6, capsule, × 2, from French Creek, Albany Co., Wyoming, *Goodding*, no. 2036.

PLATE 362. RIBES CYNOSBATI L.: FIG. 2, fruiting branch, × 1, from Stowe, Vermont, July 8, 1908, *R. W. Woodward.*

R. CYNOSBATI, var. ATROX, n. var.: FIG. 1, fruiting branch, × 1, from Little Current, Manitoulin Island, Ontario, *Fernald & Pease*, no. 3358 (TYPE).

PLATE 363. RUBUS PARVIFLORUS Nutt., × 1/10, in border of mixed woods, Bête Grise, Keweenaw Co., Michigan.

PLATE 364. RUBUS PARVIFLORUS Nutt., var. GENUINUS: FIG. 1, young calyx, × 10, and FIG. 2, portion of mature sepal, × 10, showing the long villosity hiding the glands, from Mackinac Island (type-locality), Michigan, July 1881, *T. E. Boyce.*

Var. VELUTINUS (Hook. & Arn.) Greene: FIG. 3, peduncle, × 10, from California, *Ross*, and FIG. 4, lower surface of young leaf, × 10, to show the dense villosity, from California, *Thos. Coulter*, no. 147.

Var. HYPOMALACUS, n. var.: FIG. 5, lower surface of leaf, × 10, showing characteristic pubescence, from Olympic Mts., Washington, *J. M. Grant*, no. 211 (TYPE). NOTE: The pubescence of var. *bifarius* is similar.

Var. HETERADENIUS, n. var.: FIG. 6, portion of pedicel and calyx, × 10, showing the long glands, from near Victoria, British Columbia, June, 1896, *C. E. Cummings.* NOTE: The pedicel and calyx of var. *hypomalacus* are

similar. Fig. 7, lower surface of leaf, × 10, from Falcon Valley, Washington, *Suksdorf*, no. 1758 (type). Note: The lower surfaces in vars. *grandiflorus* and *scopulorum* are similar.

Plate 365. Rubus parviflorus Nutt., var. grandiflorus Farwell: fig. 4, portion of pedicel and calyx, × 10, showing glandularity intermediate between that of vars. *heteradenius* and *scopulorum*, from Lead City, South Dakota, *Rydberg*, no. 655. Note: The pedicels and calyx of var. *bifarius* are similar.

Var. scopulorum (Greene) Fern.: fig. 5, pedicel, × 10, showing the very abbreviated glands, from La Plata Cañon, Colorado, *Baker, Earle & Tracy*, no. 680.

Var. parvifolius (Gray) Fern.: fig. 1, two plants, × ⅔, from Pecos River National Park, New Mexico, *Standley*, no. 4032; fig. 2, calyx and summit of pedicel, × 10, showing essential lack of glands, from Santa Fé Creek, New Mexico, *Fendler*, no. 208 (type): fig. 3, lower surface of leaf, × 10, showing reduction of pubescence, from the type.

Plate 366. Chamaerhodos Nuttallii Pickering, var. keweenawensis, n. var.: fig. 1, plant, × 1, of type-collection, West Bluff, Keweenaw Co., Michigan, *Fernald & Pease*, no. 3376; fig. 2, branch, × 10, showing pubescence, from type.

C. Nuttallii: fig. 3, branch, × 10, to show pubescence, from type-locality, Mandan, North Dakota, June 23, 1912, *O. A. Stevens*.

Plate 367. Potentilla fruticosa L., forma villosissima, n. f.: fig. 1, fruiting branch, × 1; fig. 2, leafy branch, × 1; fig. 3, branchlet, × 3; all from Great Cloche Island, Ontario, *Fernald & Pease*, no. 3382 (type).

Plate 368. Geum virginianum L.: type (plant of *Hortus Upsaliensis* in Herb. Linnaeus). Photograph from Mr. S. Savage, Assistant Secretary, Linnean Society of London.

Plate 369. Geum aleppicum Jacq.: reproduction from Jacquin, Ic. Pl. Rar. i. t. 93.

Plate 370. Geum aleppicum Jacq.: fig. 2, portion of fruiting head, showing villous achenes, × 4, from Nízké, Tatry Mts., Slovakia, *Domin & Krajina*, Fl. Cechoslov. Exsicc., no. 272; fig. 3, achene, × 10, from Lyck, East Prussia, July 1, 1858, *C. Sania*.

G. aleppicum, var. strictum (Ait.) Fern.: fig. 1, small fruiting plant, showing variation of basal leaves, × ⅔, from Willoughby, Vermont, July 18, 1896, *E. F. Williams;* fig. 4, portion of fruiting head, showing sparsely pubescent achenes, × 4, from Kidstone Island, Nova Scotia, *Fernald & Long*, no. 21,521; fig. 5, achene, × 10, from Richmond, New Hampshire, September 8, 1926, *C. F. Batchelder*.

Plate 371. Geranium dissectum L.: fig. 1, calyx, × 5, of *G. laxum* Hanks, from Friday Harbor, San Juan Islands, Washington, *Zeller*, no. 834; fig. 2, carpel-body, × 5, from Biltmore, North Carolina, *Biltmore Herb.*, no. 4868; fig. 3, seed, × 10, from Tyrone, Ireland, 1896, *Leebody;* fig. 4, seed, × 10, of *G. laxum* Hanks, from near Milwaukie, Oregon, *Suksdorf*, no. 2450; fig. 5, seed, × 10, from *Biltmore Herb*, no. 4868; fig. 6, surface of seed, × 50, from Tyrone, Ireland, *Leebody;* fig. 7, surface of seed, × 50, of *G. laxum* Hanks, from *Suksdorf*, no. 2450.

G. Bicknellii Britton: fig. 8, calyx, × 5, from Bathurst, New Brunswick, July 25, 1902, *Williams & Fernald;* fig. 9, seed, × 10, from West Roxbury, Massachusetts, *Floyd*, no. 1041; fig. 10, seed, × 10, from Sorrento, Maine, July 27, 1889, *G. G. Kennedy;* fig. 11, surface of seed, × 50, from Sorrento.

G. Bicknellii, var. longipes (Wats.) Fern.: fig. 12, calyx, × 5, from Seely Lake, Montana, *Kirkwood*, no. 1836; fig. 13, peduncle and pedicel, × 10, from type, Washatch Mts., Utah, *Watson*, no. 206; fig. 14, peduncle and pedicel, × 10, from isotype of *G. nemorale* Suksdorf, West Klickitat Co., Washington, *Suksdorf*, no. 2058; fig. 15, carpel-body, × 5, from Ione, Washington, *Kreager*, no. 406; fig. 16, seed, × 10, from Washington, *G. R. Vasey*, no 217; fig. 17, seed, × 10, from Blue Mts., Walla Walla Co., Washington, August 2, 1896, *Piper;* fig. 18, surface of seed, × 50, from last specimen.

PLATE 372. GERANIUM SPHAEROSPERMUM, n. sp.: FIG. 1, portion of fruiting plant, × 1, from TYPE, Great Cloche Island, Ontario, *Fernald & Pease*, no. 3405; FIG. 2, calyx, × 5, from TYPE; FIG. 3, carpel-body, × 10, from TYPE; FIG. 4, seed, × 10, from TYPE; FIG. 5, surface of seed, × 50, from TYPE.

G. TEXANUM (Trel.) Heller; FIG. 6, calyx, × 5, from TYPE, New Braunfels, Texas, *Lindheimer;* FIG. 7, carpel-body, × 10, from Corpus Christi, Texas, *Tracy*, no. 9215; FIG. 8, seed, × 10, from no. 9215; FIG. 9, seed, × 10, from TYPE; FIG. 10, surface of seed, × 50, from TYPE.

PLATE 373. GERANIUM CAROLINIANUM L.: Copied (reduced) from Dillenius, Hort. Elth. t. 135.

PLATE 374. GERANIUM CAROLINIANUM L., var. CONFERTIFLORUM, n. var.: FIG. 1, portion of fruiting plant, × 1, from TYPE, North Amherst, Ohio, *R. J. Webb*, no. 5263; FIG. 6, calyx, × 5, from Alexandria, Virginia, *Wiegand & Manning*, no. 1692; FIG. 2, carpel-body, × 10, from Warwick, Rhode Island, June 25, 1910, *Fernald;* FIG. 3, seed, × 10, from TYPE; FIG. 4, seed, × 10, from New Bedford, Massachusetts, *E. W. Hervey;* FIG. 5, surface of seed, × 50, from TYPE.

G. CAROLINIANUM L.: FIG. 7, seed, × 10, of *G. Langloisii* Greene, from Gretna, Louisiana, *Ball.* no. 301; FIG. 8, surface of seed, × 50, from no. 301.

PLATE 375. VIOLA SEPTENTRIONALIS, var. GRISEA, n. var.: FIG. 1, fruiting plant, × 1, from Driggs, Michigan, *Fernald & Pease*, no. 3430 (TYPE); FIG. 2, base of expanding leaf, × 10, from TYPE; FIG. 3, cleistogamous fruit, to show ciliate auricles of sepals, × 10, from TYPE.

PLATE 376. LITHOSPERMUM CROCEUM, n. sp.: FIG. 1, small flowering plant, × ½, from east of Manistique, Michigan, *Fernald & Pease*, no. 3494 (TYPE); FIG. 2, fruiting stem, × ½, from Topeka, Illinois, August 22, 1904, *Gleason;* FIG. 3, back of bract, showing characteristic pubescence, × 10, from Pelee Island, Ontario, August 20, 1914, *MacDaniels & Eames;* FIG. 4, fruiting calyx, showing prominent costa, × 4, from Southampton, Ontario, *Macoun*, no. 54,342; FIG. 5, portion from summit of tube and base of corolla-lobe, to show characteristic reticulate venation, × 10, from TYPE.

L. CAROLINIENSE (Walt.) MacM.: FIG. 6, back of bract, showing characteristic pubescence, × 10, from Columbia, South Carolina, *Canby*, no. 75; FIG. 7, fruiting calyx, showing flat sepals, × 4, from near Antlers, Pushmatah Co., Oklahoma, *E. J. Palmer*, no. 39,403; FIG. 8, portion from summit of tube and base of corolla-lobe to show characteristic non-reticulate venation, × 10, from *Canby*, no. 75.

PLATE 377. TANACETUM HURONENSE Nutt., var. TYPICUM: FIG. 1, flowering stem and basal leaf, × ⅔, from Manistique, Michigan, *Fernald & Pease*, no. 3567; FIG. 2, achene, × 10, from Lake Superior, *Loring*.

Var. BIFARIUM, n. var.: FIG. 3, flowering plant, × ⅔, from Rivière McKane, Ile d'Anticosti, Quebec, *Victorin & Rolland*, no. 27,564 (TYPE); FIG. 4, basal leaves, × ⅔, from Rivière des Caps, Anticosti, *Victorin & Rolland*, no. 27,566.

PLATE 378. TANACETUM HURONENSE Nutt., var. TERRAE-NOVAE Fern.: FIGS. 1–3, flowering plants, × ⅔, from St. John Island, Newfoundland, *Fernald et al.*, no. 29,201; FIG. 4, achene, × 10, from Sandy Cove, Ingornachoix Bay, Newfoundland, *Fernald, Long & Dunbar*, no. 27,157.

Var. JOHANNENSE, n. var.: FIG. 5, flowering branch, × ⅔, from St. John River, Westfield, New Brunswick, *Fernald*, no. 2262; FIG. 6, achene, × 10, from St. John River, Woodstock, New Brunswick, *Fernald & Long*, no. 14,860.

PLATE 379. ARNICA WHITNEYI, n. sp.: FIG. 1, small flowering plant and basal rosette, × ⅔, from Copper Harbor, Michigan, *Fernald & Pease*, no. 3579 (TYPE); FIG. 2, portion of involucre, × 2, from Eagle Harbor, Michigan, no. 3580; FIG. 3, tip of ligule, × 2, from TYPE; FIG. 4, disk-corolla, × 5, from TYPE; FIG. 5, achene, × 5, from TYPE.

A. CORDIFOLIA Hook.: FIG. 6, portion of involucre, × 2, from Carson, Colorado, *C. F. Baker*, no. 312; FIG. 7, tip of ligule, × 2, from Druid Peak, Yellowstone National Park, *Nelson & Nelson*, no. 5805; FIG. 8, disk-corolla, × 5, from Pyramid Lake, Jasper Park, Alberta, *J. M. Macoun*, no. 96,019; FIG. 9, achene, × 5, from Ross Hole, Montana, *S. Watson*, no. 232.

THE SPORES OF THE GENUS SELAGINELLA IN NORTH CENTRAL AND NORTH EASTERN UNITED STATES

R. M. Reeve

(Plates 380 and 381)

That spores of Pteridophytes may be used in the identification of species is illustrated in the genus *Isoetes*[1] and in the genus *Lycopodium*.[2] It is also apparent that the spores of the genus *Selaginella* likewise show specific characters.

The spores were obtained from herbarium specimens from various parts of the United States. The preparation of the material consisted of soaking the specimens in warm water to facilitate removal of the sporangia; boiling the spores for a few seconds in 10% KOH on a slide; washing a number of times in distilled water; and mounting in glycerine jelly. In some cases the spores were heated in water in a watch glass over a beaker of boiling water; glycerine jelly containing a stain was then added and evaporated to the desired consistency for mounting. The KOH was used to clear the spores so that the exine features would be more distinct. Staining with methyl green in glycerine jelly was found to be very satisfactory. The use of safranine used after the KOH treatment was also a good method providing the spores were left in the stain for only a few seconds. In some cases staining was unnecessary.

The spores were examined under a compound microscope using a 7.5 × ocular and the 4 mm and 16 mm objectives for the micro- and megaspores respectively. The outlines of the surface features were traced with the aid of a camera lucida. The apical surface is that upon which the germinating slits are found, and the basal surface (more or less dome-shaped) is the opposite surface. With the exception of *Selaginella rupestris*, the drawings are of these two surfaces for both micro- and megaspores. In that species, however, the apical surface as it appears for the spores of the other species is absent and the drawings were made of the two types found. A slight variation in size, shape, and pattern of the spores occurs, due to age, condition, and treatment of the specimens; but the distinguishing characters are quite readily found. Many spores of each species were examined and typical individuals were chosen for the drawings.

[1] Gray's Manual, 7th Edition. A. A. Eaton.

[2] Wilson, L. R. 1934. Spores of the genus *Lycopodium* in the United States and Canada. Rhodora. 36: 13–19.

The species here treated are *S. selaginoides*, *S. apoda*, *S. rupestris*, and *S. densa*. These four species show unmistakable characters in the ornamentation of both micro- and megaspores.

In *S. selaginoides* the microspores are spinose on the basal side, each having twenty-five to thirty-two blunt spines which are nearly flat across the point and average 8 mu in length (Plate 380). The apical surface is smooth and the germinating slits are on prominently raised ridges, each of which extends nearly the full radius of the spore. The spores themselves are very slightly triangular in outline, and measure from 32 to 38 mu in diameter exclusive of the spines.

The megaspores of this species are large, ranging from 580 to 600 mu in diameter, and appearing pale yellow and about one-third the size of a pin-head to the naked eye. The exine is distinctly papillate on both the apical and basal surfaces. The numerous papillae are from 3 to 3.5 mu in width, and from 5 to 7 mu in length (Plate 381). In both micro- and megaspores the apical surface is similar to a flattened pyramid, the basal surface like a more or less flattened dome.

The microspores of *S. apoda* are the smallest of any of the four species, ranging from 24 to 27 mu in diameter (Plate 380). Both the apical and the basal surfaces are marked by small, dome-like ridges averaging about 3 mu across, so that the spore coat sometimes appears to be pitted. The germinating slits are prominent.

The megaspores are likewise the smallest of the four species, ranging from 330 to 370 mu in diameter (Plate 381). The basal surface is marked by ridges of reticulation which range from 25 to 50 mu in distance apart. Many of these ridges lower into the general level of the spore coat; and around the edge of the spore the ridges appear as a folded, translucent margin. On the apical surface the reticulation fades into wrinkles and folds in the exine near the edge. The central portion of the apical surface is relatively smooth, marked by only a few minor wrinkles. The germinating slits are on a prominent ridge.

Both the micro- and megaspores are nearly circular in outline and appear to be slightly more spherical than those of *S. selaginoides*.

The spores of *S. rupestris* show distinctly different characters from those of the other three species. Both micro- and megaspores vary considerably in size, and "dumb-bell" spores are quite common, occurring one in every thirty or forty spores. The single microspores are from 45 to 60 mu in diameter and are marked by wrinkles which vary from few to many on the spore coat (Plate 380). The single megaspores range from 300 to 500 mu in diameter and are

heavily reticulate (Plate 381). The ridges of reticulation are drawn into a disconcentric ring of papillae-like ends where the spores were attached previous to division. Both micro- and megaspores are more or less spherical and are without an apical surface such as is found on the spores of the other species, indicating that they occur from a diad formation. The "dumb-bell" spores in each case have smaller diameters at each end than the diameters of the single spores.

In none of the *S. rupestris* material examined were tetrads of spores found, or was there any indication of an apical surface as is typical of the spores formed from tetrad division. Miss Mitchell[1] states that *S. rupestris* was found to have several cases of inequality in the size of the spores, and that "in *S. rupestris* there are normally two spores" in the megasporangium, and that sometimes one megaspore of correspondingly large size was found. Miss Lyon[2] figures the "dumb-bell" spores of *S. rupestris*, but fails to describe any differences in the appearance of spores found in megasporangia containing more than two spores, and whether or not they had germinating slits. Sterile spores have been known to be common in this species, and the variability in size, and the presence of "dumb-bell" spores is indicative of hybridization.[3]

In *S. densa* the diameter of the microspores is from 37 to 42 mu. The basal surface is papillose, the tiny papillae appearing only about one micron in width and not profuse. The apical surface is not definitely ornamented and the germinating slits are on a prominent ridge (Plate 380).

The megasporangia of this species are heavily reticulate on both the basal and the apical surfaces, the reticulation on the apical surface being much closer and the ridges appearing folded together near the germinating slits, sometimes running into the ridge of the germinating slit. The diameter of the megaspores ranges from 350 to 390 mu (Plate 381).

Like *S. apoda*, the reticulation at the edge appears as a folded translucent margin; however, there are considerably fewer ridges which lower to the general level of the exine. The ridges of reticulation on *S. densa* range from 20 to 30 mu apart on the basal surface and slightly closer together on the apical surface. The spores of *S. densa*

[1] Mitchell, G. 1910. Contributions towards a knowledge of the Anatomy of the genus *Selaginella*, Spr. V. The Strobilus. Ann. of Bot. V. XXIV.

[2] Lyon, F. M. 1901. A study of the sporangia and gametophytes of *Selaginella apus* and *Selaginella rupestris*. Bot. Gaz. V. XXXII. 124–141, 170–194.

[3] Graustein, J. E. 1930. Evidences of Hybridization in *Selaginella*. Bot. Gaz. V. XC. 46–74.

appear even slightly more spherical than those of the first two species.

Some authors reduce *S. densa* to a variety of *S. rupestris;* however, its constant vegetative and spore characters would indicate that it is a distinct species. In no cases were the spores found to vary from tetrad formation in *S. densa*. Further work on the *S. rupestris* group is now in progress.

The writer is deeply indebted to Prof. L. R. Wilson for aid, criticism, and the suggestion of the problem; and he also wishes to express his thanks to the following for specimens which they kindly supplied: Dr. H. S. Conard, Dr. J. H. Ehlers, Mr. Albert M. Fuller, Dr. George B. Rigg, and Mr. J. W. Thompson,

Coe College, Cedar Rapids, Iowa.

THE GENUS NAJAS IN MINNESOTA

C. O. Rosendahl and F. K. Butters

(Plate 382)

Three species of *Najas* have hitherto been recorded for Minnesota. These are *N. marina, N. guadalupensis,* and *N. flexilis.* The first named species is represented in the University herbarium by only two collections, one from Lake Minnewashta in Pope County, the other from Big Stone Lake on the western border. Both are fresh water lakes. *N. guadalupensis* is likewise known from only two stations, one at Winona, the other in Jefferson Township, Houston County, in the extreme southeastern corner of the state. The two species are obviously rare within our borders, but undoubtedly more careful search in the respective areas would locate more stations. *N. flexilis,* on the other hand, is very generally distributed throughout the entire state except in the northeastern corner, and in many of our lakes it is one of the most abundant species of aquatic plants. It is quite variable as regards size and habit of growth, ranging from small tufted forms 2–3 inches high on sandy or rocky bottoms in shallow water to long stringy plants 3–4 feet long, rooting in the muck at depths of 4–8 feet. In addition to vegetative differences, there is considerable variation in the form and size of the seed, but whether these variants can be referred to some of the subspecific segregates that have already been described or whether they represent new varieties or forms can be determined only by more detailed investigation.

Our preliminary work has, however, resulted in two noteworthy additions to the known Naiad flora of Minnesota. First, the undoubted occurrence in the vicinity of the Twin Cities of the local and apparently rare *N. gracillima*, and, second, the discovery of an entirely distinct and undescribed species from a lake in Kandiyohi County near the middle of the state. The former was found mixed with a collection of *N. flexilis* (*Rosendahl* No. 5509, Oct. 1927) from a small pond in northwestern Ramsey County, about 5 miles north of Minneapolis. The distribution of *N. gracillima* is given in Gray's New Manual (7th Ed.) as "e. Mass. to e. N. Y., N. J., and Pa.; Mo." Since then, Dr. Fernald[1] has questioned the authenticity of its reputed occurrence in Missouri and has shown that in all probability the report was based on the misreading of the label on a sheet in Engelmann's Herbarium. He calls attention to the fact that the species is localized, occurring in muddy, peaty, or sandy ponds or pools from southern N. J. and eastern Pa. northeastward near the coast to Knox County, Me., and up the Hudson River Valley to Saratoga County. Very recently, however, Dr. Fassett[2] has reported the species from three stations in Wisconsin, two of which are situated along the middle eastern border of the Driftless Area and the third in Sawyer County some distance to the northwestward. The station for *N. gracillima* in Minnesota is situated in an area of sandy plains and low morainic ridges, throughout which occurs a considerable number of the so-called Atlantic Coastal Plain species. The explanation of its disrupted range, *i. e.* Atlantic Coast from Knox County, Me., to eastern Pa. and eastern New York and in ponds of the acid, sandy areas of western Wisconsin and eastern Minnesota, is obviously linked up with the larger problem of the isolated presence of characteristic elements of the Atlantic Coastal Plain flora near the middle interior of the continent.

The new species of *Najas* referred to above was discovered in the course of a field excursion undertaken in September, 1933. The plant at once attracted attention because of its very different appearance from the ubiquitous *N. flexilis*. In fact, when first seen through the water, it was suspected of being *N. marina*, but an examination of the leaves soon revealed that they lacked the characteristically wavy-toothed margin and spiny midrib of that species. Closer study in the laboratory brought out the fact that it was entirely distinct from the

[1] Fernald, Rhodora **25**: 105. 1925.
[2] Fassett, Rhodora **36**: 149. 1934.

other species recorded for the state and further that it could not be referred to any of the species treated in the latest monograph of the genus.

In the material collected in 1933, no staminate flowers could be found. Accordingly, the description and publication of the species was deferred with the expectation of securing more adequate specimens the following season, and the station was revisited last September. Although it happened to be a very stormy day and the water was roiled to such an extent that it was impossible to see the lake bottom, after a considerable amount of blind fishing with a garden rake, we finally procured a few plants that contained the desired staminate flowers.

NAJAS **olivacea**, n. sp. (TAB. 00). Planta densa olivacea monoeca ramis ad 25 cm. longis 1–1.5 mm. latis inferne repentibus ad nodos radicantibus superne prostratis vel ascendentibus crebro furcatis, internodiis inferioribus 2–3 cm. longis, his superioribus brevioribus; foliis lineari-lanceolatis apicem versus subacutum angustatis 9–18 mm. longis 1.5–2 mm. latis serrulatis 20–40 spinulis minutis in latere singulo, vaginis declivibus 2.5–3.4 mm. latis in latere singulo 4–8 spinulis munitis; floribus solitariis, masculis spatha ovoidea 2.5 mm. longa spinulas 3–5 apicem versus ferente, anthera quadri-loculari circa 1 mm. longa, 0.7–0.8 mm. lata, filamento crasso; floribus femineis nudis, 2.8 mm. longis, ovario vix crassiore quam stylo stigmatibus binis subulatis atque processubus binis spiniferis instructo; seminibus ellipsoidalibus leviter falcatis atque compressis 2.3–2.5 mm. longis flavescentibus levibus sed haud politis areolas plurimas subsexangulares permonstrantibus his mediis paulum transversim elongatis 87 x 125 μ, illis fines seminis versus minoribus vix elongatis; testa e stratis cellularum tribus composita, cellulis extimis (areolis) majusculis parietibus percrassis (39 μ), eis strati medii magis minoribus parietibus crassiusculis, eis strati intimi paullis depressis parietibus tenuibus.

Plants monoecious, olive-green, of bushy habit, shoots repent towards the base and freely rooting at the nodes, spreading to ascending and dichotomously much-branched, up to 25 cm. long, 1–1½ mm. thick (living), lower internodes 2–3 cm. long, gradually shortening towards the ends of the branches; leaves 9–18 mm. long, linear-lanceolate, 1.5–2 mm. wide at the top of the sheath, gradually tapering to the sub-acute apex, with 20 to 40 minute marginal spines on each side; sheaths 2.5–3.4 mm. wide, each margin with 4–8 spines (sheath of upper leaf at each node regularly wider than that of the lower).

Spathe with enclosed staminate flower narrowly ovoid, 2.5 mm. long, bearing 3–5 minute spines at the apex; anther quadrilocular, about 1 mm. long, 0.7 to 0.8 mm. wide, filament stout: pistillate flower 2.8 mm. long, ovary only slightly thicker than the style, stigmas 2, tapering, alternating with 2 slightly longer, spine-tipped

processes; pericarp purple-tinged, seeds ellipsoidal, slightly falcate and flattened, 2.3–2.5 mm. long, pale yellow, smooth but not lustrous, areolae conspicuous under a lens, those of the middle portion of the seed largest, averaging 87 x 125 μ, their longest diameter transverse to the axis of the seed, those towards the ends of the seeds somewhat smaller and more nearly isodiametric; seed coat consisting of three layers of cells, those of the outer layer—the areolae—with very thick, minutely pitted walls (averaging 39 μ thick), cells of the middle layer much smaller and with moderately thickened walls, those of the inner layer thin-walled and flat.

Growing in 1–3 feet of water, on muddy bottom, Norway Lake, Kandiyohi County, Minnesota. Type (*Rosendahl and Butters* No. 6446, Sept. 6, 1933) in the Herbarium of the University of Minnesota.

The species belongs to the Section *Americanae* of which the only other known representatives in the United States are *Najas flexilis* and *Najas guadalupensis*. It is readily distinguished from the former by the olive-green color, the more spreading habit of growth, the wider and shorter leaves, but especially by the quadrilocular anther and the non-lustrous, blunter, slightly falcate seeds with much larger, thicker-walled areolae. In *N. flexilis* the areolae are inconspicuous under a hand lens, and in the middle portion of the seed average 67 x 41 μ, with the longer axis parallel to the long axis of the seed. In *N. olivacea* the areolae are very conspicuous under low magnification, and in the corresponding area of the seed average 125 x 87 μ, with the longer axis transverse to the long axis of the seed. In the former the walls of the areolae average 23 μ thick, while in the latter they are 39 μ and more finely and evenly pitted.

From *N. guadalupensis*, *N. olivacea* differs in its much stouter habit, larger seeds, and especially in the structure of the testa. In *N. guadalupensis* the cells of the outer layer of the testa are large and very thin-walled, collapsing at length upon the thick-walled middle layer to produce shallow pits on the surface of the ripe seed.

University of Minnesota.

Explanation of Plate

Najas olivacea n. sp. Fig. 1, part of branching shoot × 1.2; Fig. 2, lower leaf; Fig. 3, upper leaf from same node × 3; Fig. 4, margin of leaf showing one-celled spines × 67; Fig. 5, young pistillate flower × 15; Fig. 6, one stigma lobe with adjoining sterile process × 67; Fig. 7, staminate flower, with enclosing spathe × 15; Fig. 8, mature fruit × 15; Fig. 9, ripe seed × 17; Fig. 10, epidermal cells of testa (areolae) from near the middle of the seed × 54; Fig. 11, cross section of testa × 160.

Volume 37, no. 440, including pages 269–308 and plates 363–375, was issued 1 August, 1935.

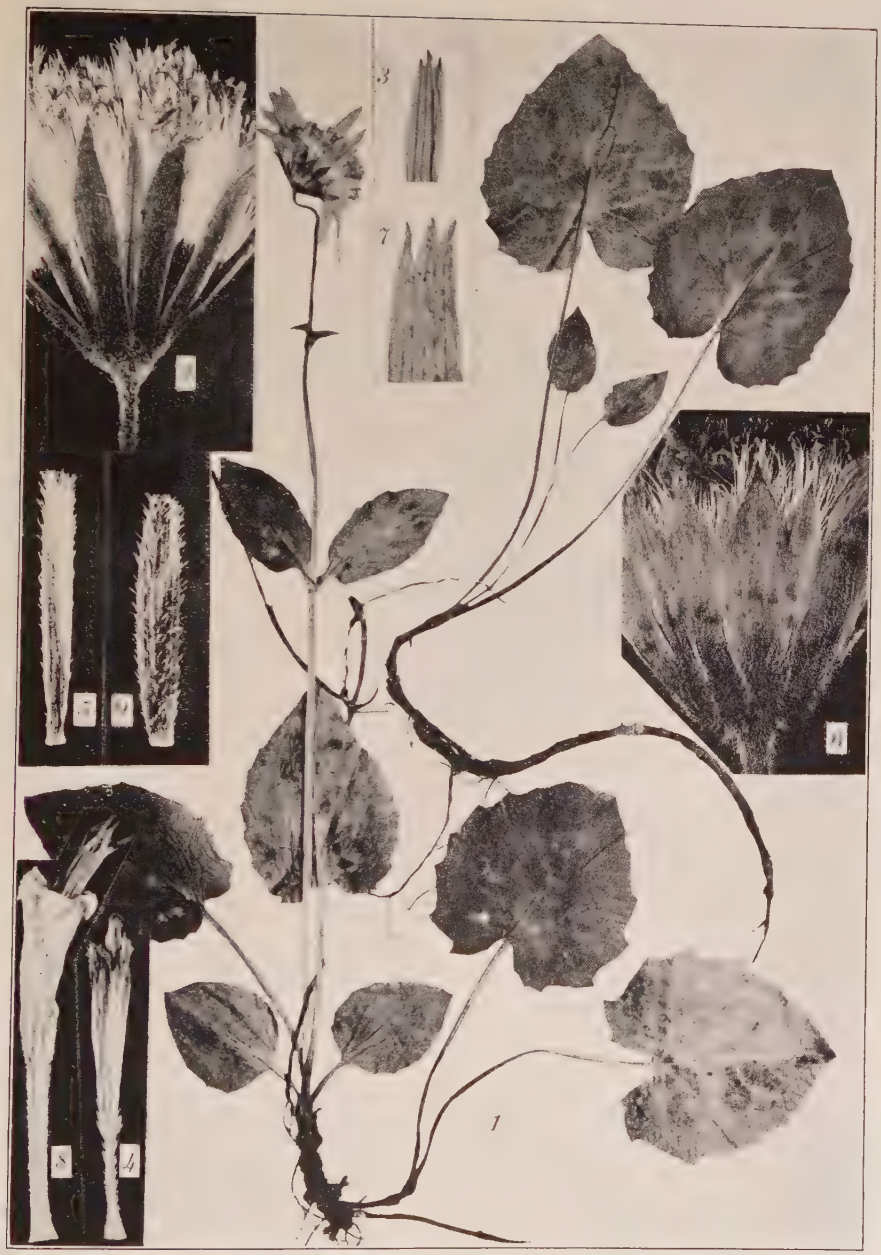
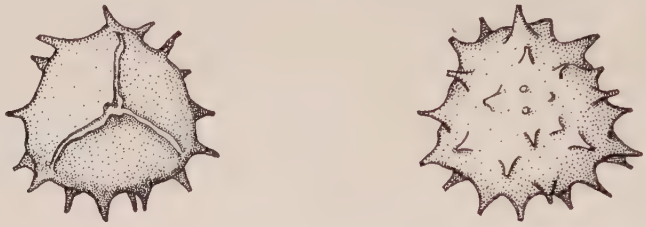


Photo. E. C. Ogden.

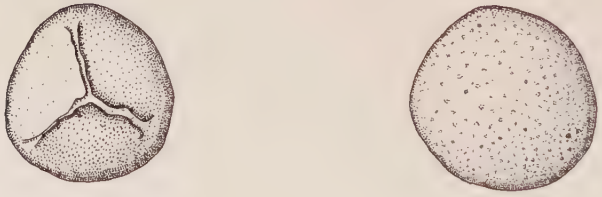
ARNICA WHITNEYI: FIG. 1, small flowering plant and basal rosette, × ⅔; FIG. 2, portion of involucre, × 2; FIG. 3, tip of ligule, × 2; FIG. 4, disk-corolla, × 5; FIG. 5, achene, × 5; all from Michigan (TYPE).

A. CORDIFOLIA: FIG. 6, portion of involucre, × 2, from Colorado; FIG. 7, tip of ligule, × 2, from Wyoming; FIG. 8, disk-corolla, × 5, from Alberta: FIG. 9, achene, × 5, from Montana.

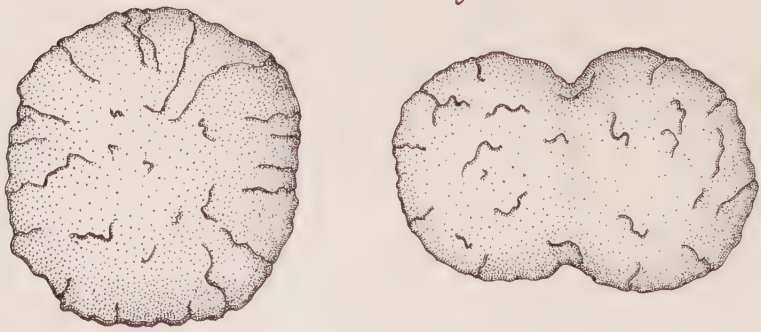


S. selaginoides (L.) Link.

S. apoda (L.) Fernald.

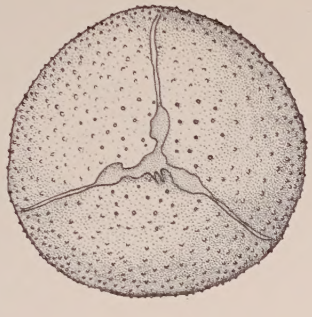


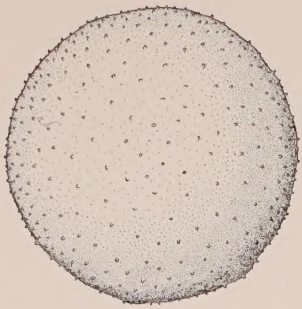
S. densa Rydb.



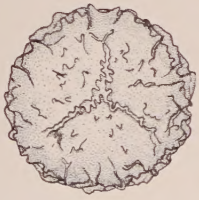
S. rupestris (L.) Spring.

Microspores of Selaginella, × 750 (camera lucida).



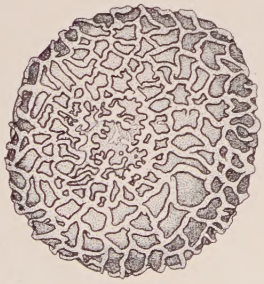


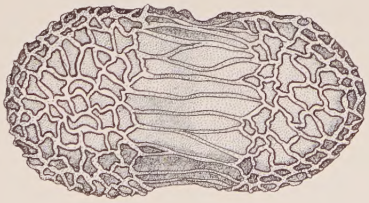
S. selaginoides (L.) Link.



S. apoda (L.) Fernald.

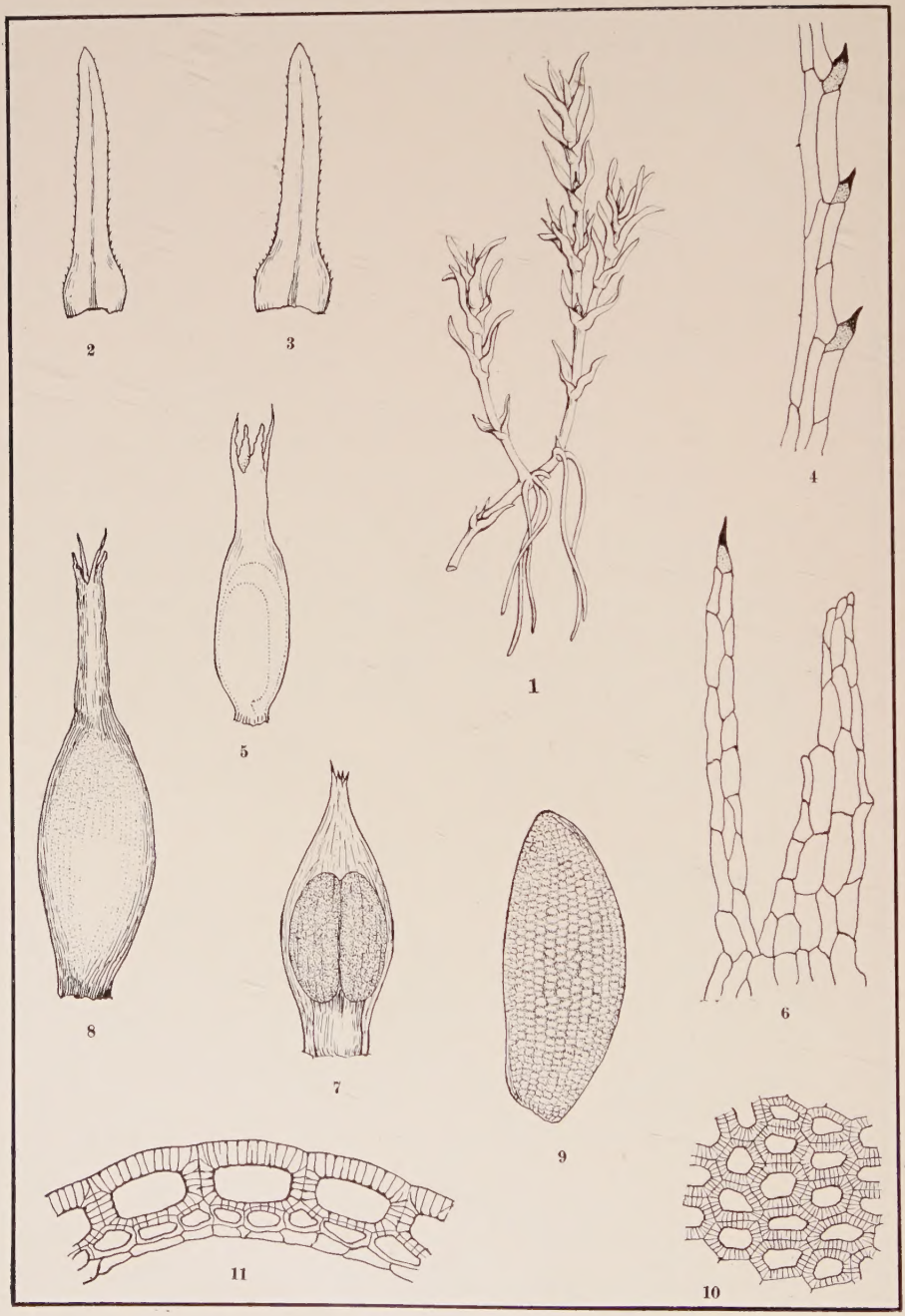
S. densa Rydb.





S. rupestris (L.) Spring.

Megaspores of Selaginella, × 75 (camera lucida).



Najas olivacea, n. sp.

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